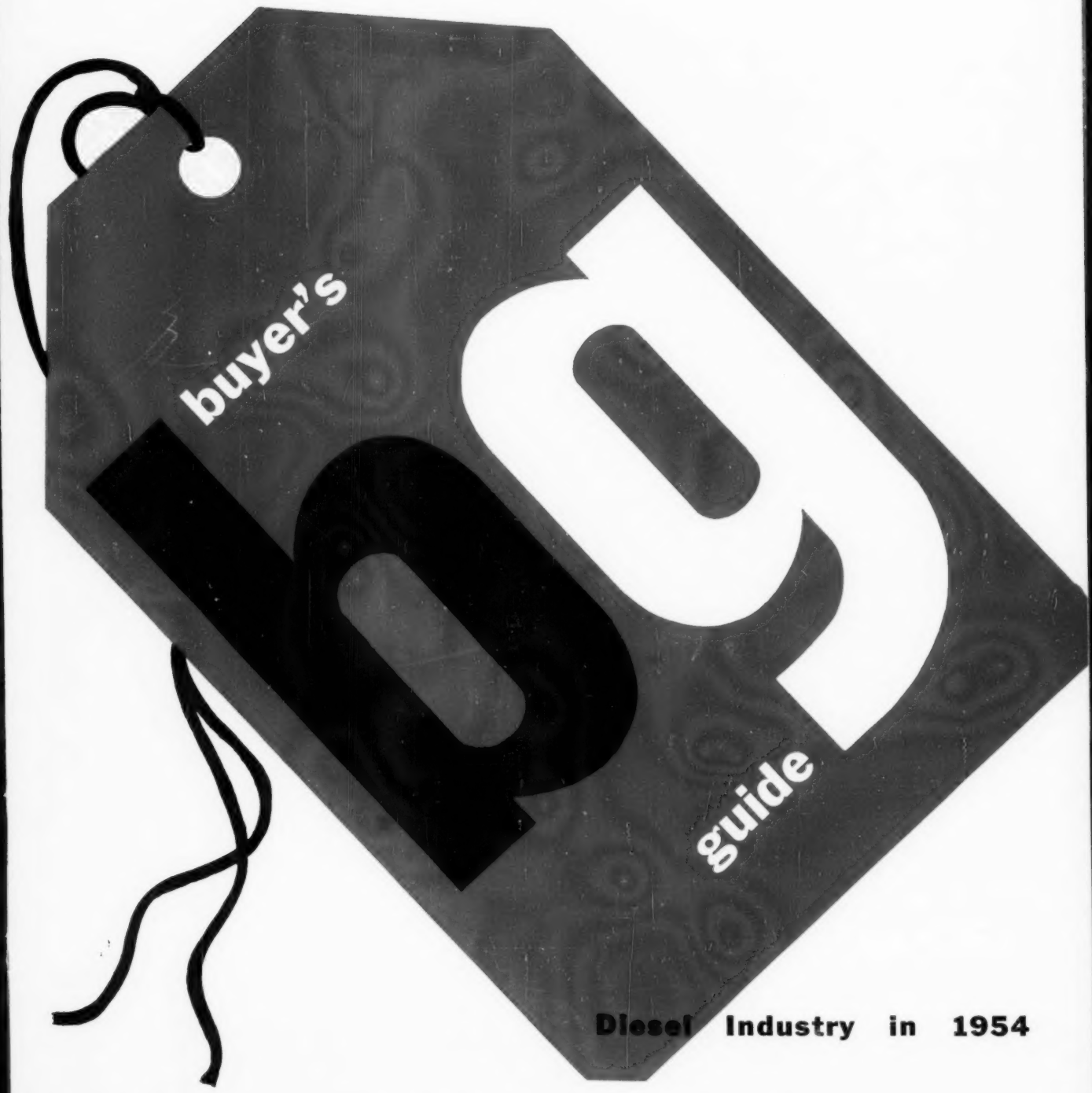
diesel power

JANUARY 1954



Diesel Industry in 1954

TYPICAL EXAMPLES DIESEL ENGINE

. . . WITH TEXACO URSA OILS

In plants everywhere, Diesels lubricated with the recommended member of the famous *Texaco Ursa Oil* series are turning in outstanding records for low maintenance costs and economical fuel consumption. For example, (names on request) —

Tulia, Texas: **Has been using *Texaco* for 20 years, never had a stuck ring. Wear has been slight, maintenance costs very low.**

Sioux Falls, South Dakota: **Engine in service 96 per cent of time for 14 years, has generated over 71 million kwh. at the rate of 12.16 kwh. per gallon of fuel consumed.**

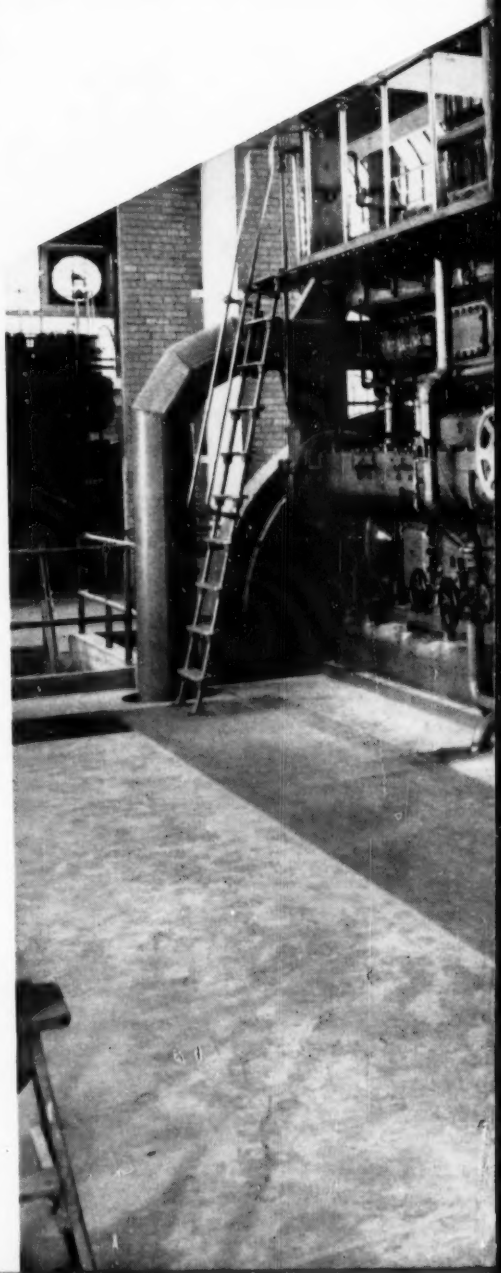
McGregor, Iowa: **Ten-year records show 12,469 h.p. hours per gallon of lube oil. Engines stay clean, with no measurable wear.**

Weatherford, Texas: **Yearly inspections show cylinder wear less than .001″ per thousand hours, no detectable bearing wear. Original rings still in use.**

The *Texaco Ursa Oil* series is *a complete line* of Diesel lubricating oils especially refined to make Diesel, gas and dual-fuel engines give *more power* with *less fuel* over *longer periods* between overhauls. That is why —

For more than twenty years, more stationary Diesel horsepower in the United States has been lubricated with Texaco than with any other brand.

Let a Texaco Lubrication Engineer help you. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

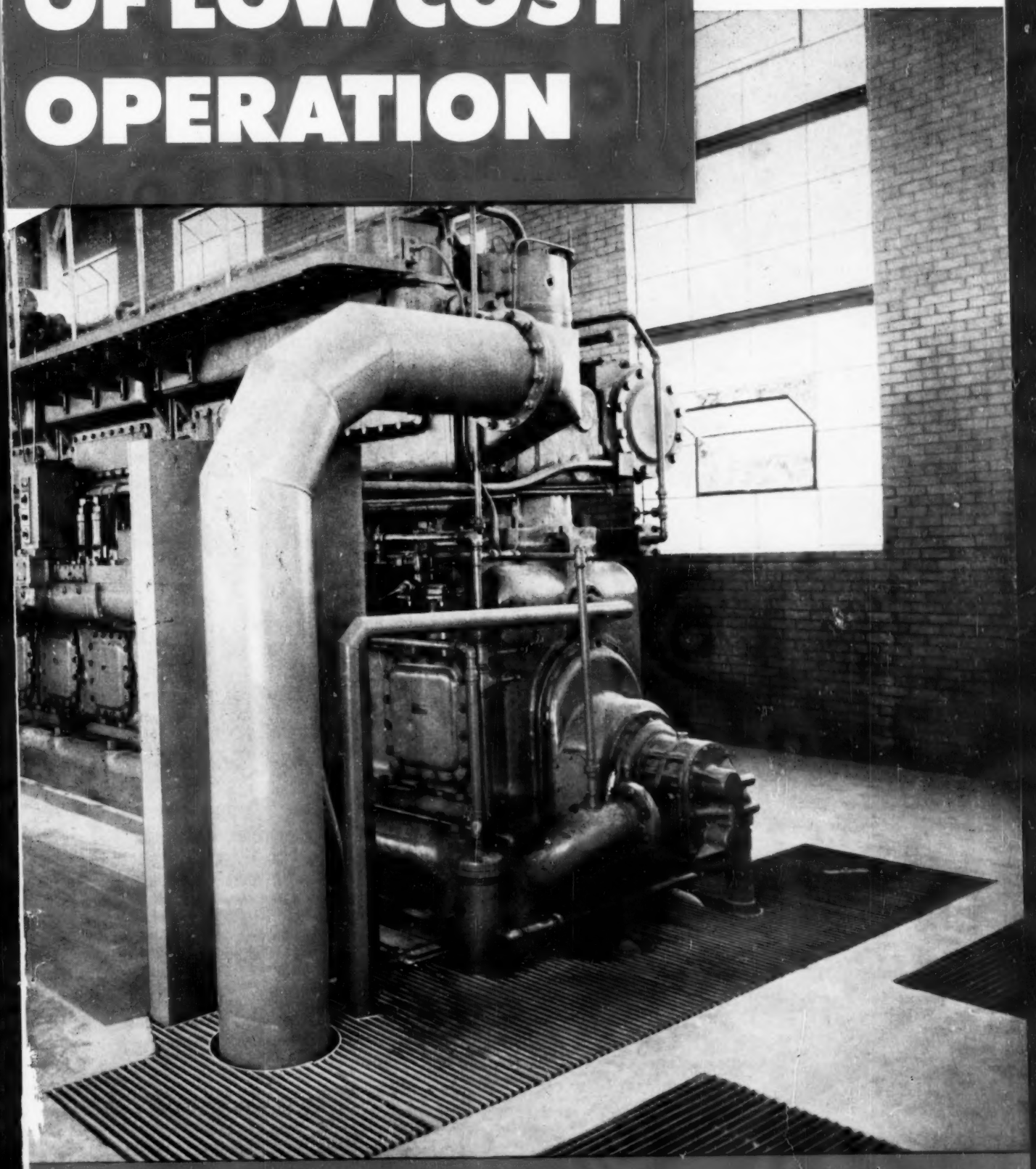


TUNE IN:
METROPOLITAN OPERA
radio broadcasts
every Saturday afternoon.
See newspaper for
time and station.

TEXACO

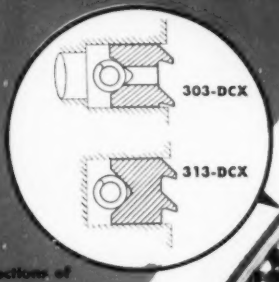
TEXACO

OF LOW COST OPERATION



URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

Why COOK "SUPER-FLEX" OIL CONTROL RINGS reduce lube-oil consumption



Sections of two typical rings.

Coil peripherial compression type expander, contained by the ring, simplifies application—fits existing grooves.

Straight-line oil flow, unrestricted by expander, assures maximum drainage.

Flexible ring section assures cylinder contact at all points—provides uniform and positive wiping action.

Tension is adjustable by inserting washers here.

Spring wire of rectangular cross-section gives expander stability—reduces localized stresses—assures uniform tension.

Ring and Expander Spring "float" in groove—cylinder contact is undisturbed by piston "slap".

Expander never touches groove lands or bottom—preventing damage to groove and expander.

COOK "SUPER-FLEX" OIL CONTROL RINGS

meet the crying demand for a more flexible ring that will conform to cylinder distortion and at the same time provide uniform wiping action all the way around the cylinder. Available in many styles to meet varying piston conditions, these advanced design oil rings reduce lube-oil consumption and maintain their efficacy throughout ring life. Write for recommendations job-engineered to your particular engine requirements. C. Lee Cook Mfg. Co., Incorporated, Louisville 3, Ky. Representatives in principal industrial cities.

COOK
PISTON RINGS

. . . SEALING PRESSURES SINCE 1888 . .

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diesel power

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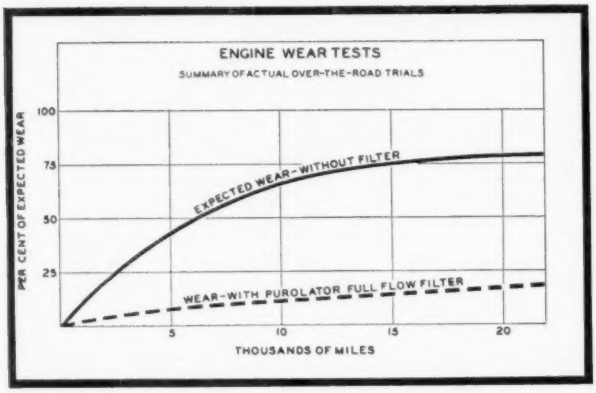
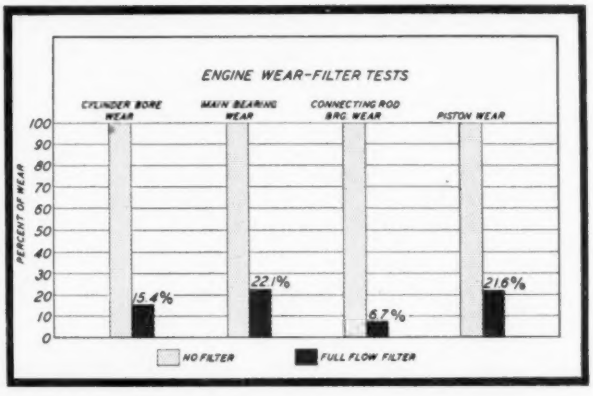
Diesel Publications, Inc., 192 Lexington Avenue, New York 16, N. Y.

This Month's Cover

Starting with this issue our covers will represent an emotional impression of one of the features of the issue. The big red tag is the "sold" tag that those listed in the Buyers' Guide would like to hang on their products.

Why leading automotive manufacturers say—





It's *Purolator** for Full-Flow!

In the charts above, you see summaries of important filter research programs, conducted independently by *two* of the world's largest automobile and truck manufacturers.

These were exhaustive investigations, taking several years to complete, in which virtually every available type and make of filter were tested.

What were the results? *Purolator filters out-performed all others by a significant margin.* In severe over-the-road tests of trucks and passenger cars, Purolator Full-Flow filters held engine wear to such an amazing minimum that often it was unmeasurable . . . while control vehicles *without* filters had to have complete engine overhauls.

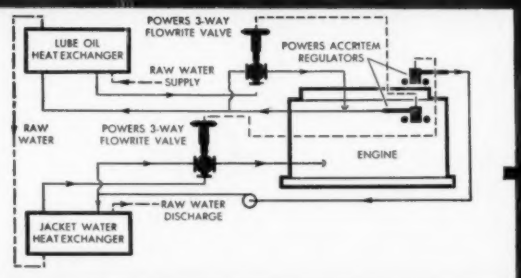
In many other comparative tests, *conducted by vehicle and engine manufacturers themselves,* Purolator filters have been proved best . . . in fineness of filtration (.0000039 in.), in filtering area, in dirt storage capacity and in durability.

If you want further proof of Purolator's superiority, why not make your *own* tests . . . in your own way . . . under your own conditions? Purolator's Engineering Department will gladly co-operate in helping you adapt modern, super-efficient Purolator Full-Flow filtration to your own requirements.

*Reg. U. S. Pat. Off.

PUROLATOR PRODUCTS, INC.
Rahway, New Jersey and Toronto, Ontario, Canada
Factory Branch Offices: Chicago, Detroit, Los Angeles

PUROLATOR
WORLD'S FINEST OIL FILTER



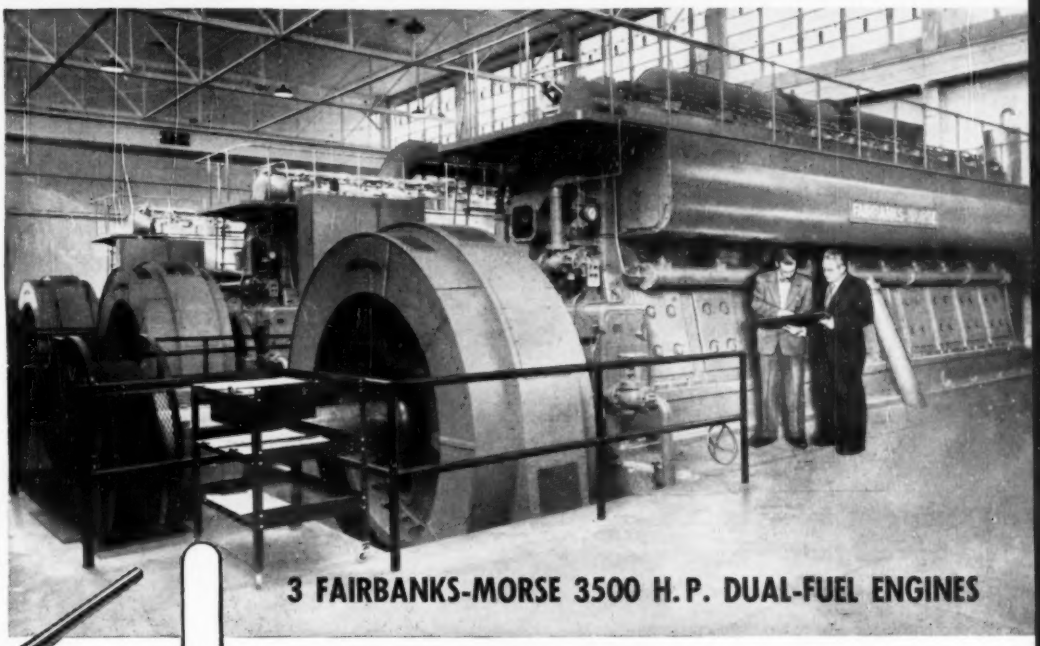
Right for the Job!

in the Hershey, Michigan Plant of

THE WOLVERINE ELECTRIC COOPERATIVE

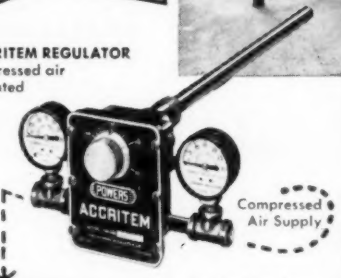
Most Efficient REA Plant

Winner of Award for most economically operated REA station in 1952. Six engines helped earn this distinction: 3 Fairbanks-Morse 3500 hp. Dual-Fuel Engines and 3 Cooper-Bessemer Dual Fuel engines.
Consulting Engineers: J. & G. Daverman Co., Grand Rapids, Mich.



3 FAIRBANKS-MORSE 3500 H.P. DUAL-FUEL ENGINES

POWERS ACCRITEM REGULATOR below is compressed air or water operated



Six of these Regulators and six **FLOWRITE** valves control lube oil and jacket water used in the F-M engines above.

Temperature sensitive bulb of regulator is inserted in lube oil or jacket water line. Has easily adjusted temperature adjustment dial. Rugged construction withstands vibration and insures years of dependable service. Is unsurpassed for reliability and power to control diaphragm valves.

Left: POWERS 3-Way **FLOWRITE** Control Valve. Six 6" pipe size valves are used in the above installation. They have many superior features which make them especially suited for large engines.

POWERS Safeguards Engine Investment

with RIGHT Type of Temperature Control for LUBE OIL and JACKET WATER

For each engine or air compressor there is a "best temperature for the lube oil and cooling water". To insure that temperature at all times regardless of variations in load or seasonal changes in temperature of water supply, install Powers Thermostatic Regulators.

Powers Regulators have been time tested and proven reliable on many large and small installations. ACCRITEM Regulators and FLOWRITE Valves shown at left are unsurpassed for dependable control of large size valves. For smaller engines Powers No. 11 Self-Operating Regulators have been widely used for many years. Either of these controls can be applied to your present engines if they are not already protected.

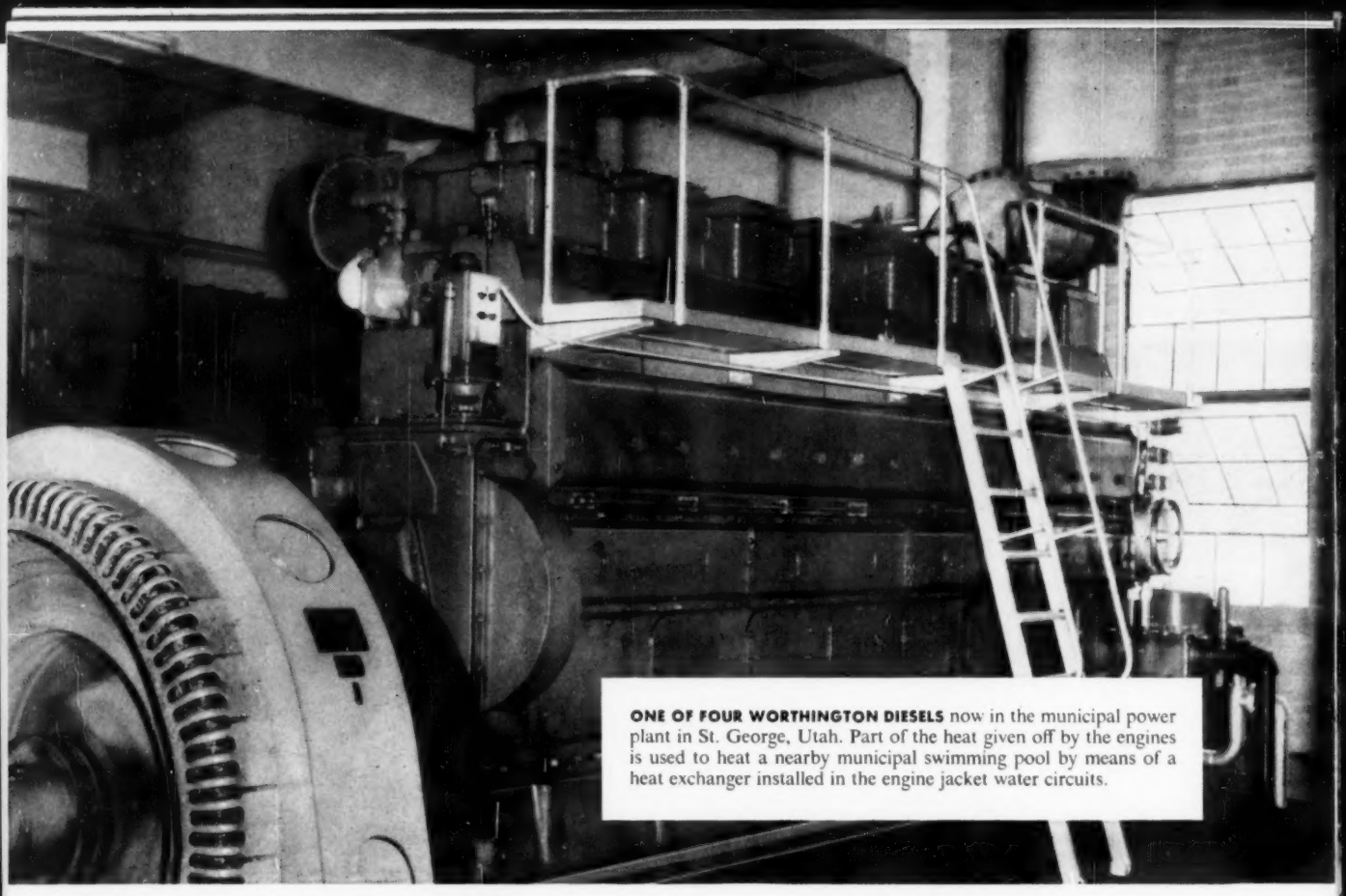
For the Right type Control for Your Engines or Air Compressors— contact Powers nearest office or write us direct. (b63)

POWERS CONTROL

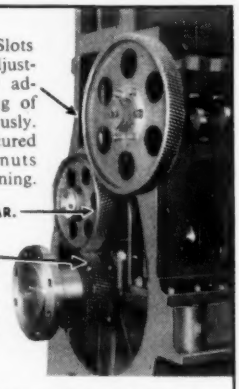
THE POWERS REGULATOR COMPANY

OFFICES IN OVER 50 CITIES IN U.S.A., CANADA, AND MEXICO • SEE YOUR PHONE BOOK

OVER 60 YEARS OF AUTOMATIC TEMPERATURE CONTROL



ONE OF FOUR WORTHINGTON DIESELS now in the municipal power plant in St. George, Utah. Part of the heat given off by the engines is used to heat a nearby municipal swimming pool by means of a heat exchanger installed in the engine jacket water circuits.



MAIN CAMSHAFT GEAR. Slots in gear provide single adjustment for retarding or advancing injection timing of all cylinders simultaneously. Final gear adjustment secured with castellated locknuts wired after final tightening.

FREE FLOATING IDLER GEAR.

SPLIT GEAR KEYED ON CRANKSHAFT. Permanent adjustment for perfect alignment with idler gear is easily accomplished.

WORTHINGTON HELICAL STEEL GEAR TRAIN
used on these Worthington dual fuel engines . . .

1. Provides accurate and positive control of engine timing.
2. Is located at flywheel end of engine for smooth gear operation as power impulses are absorbed by the flywheel.
3. Uses controlled automatic oil jet lubrication that eliminates wear.
4. Assures correct engine timing . . . keeps engine running smoothly . . . results in low fuel consumption and minimum engine maintenance.

Good planning keeps municipal power plant profitable

Eleven years ago, the City of St. George, Utah, started power-plant operations with two Worthington four-cycle, direct injection Diesel engines. Today, the capacity of St. George's plant is 500% greater than it was in 1942—and profits are still being returned to the City of St. George.

St. George planned its power plant to keep pace with increasing power needs and to continue to show profits. That's where Worthington came in. Worthington engineers helped St. George select exactly the right size and type of equipment—engines, circulating water pumps, fuel transfer pumps and air starting equipment.

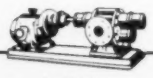
Because of its complete satisfaction with the original Worthington units, St. George purchased a third Worthington Diesel in 1947, a fourth in 1949, and a fifth in 1950. At present a total of four units are in operation, one unit having been replaced by a larger unit in 1950.

Worthington may be able to help save power costs for your community, too. Write your nearest Worthington district office or Worthington Corporation, Engine Division, Section E.3.2, Buffalo, New York.

E.3.2

Worthington-Built Auxiliaries

ENGINE STARTING COMPRESSORS



OIL TRANSFER PUMPS.

COOLING WATER CIRCULATING PUMPS

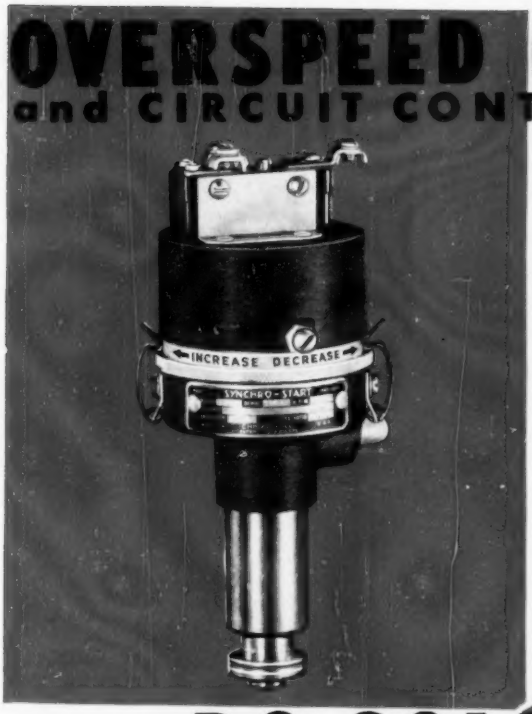
EVAPORATIVE-TYPE ENGINE WATER COOLERS

WORTHINGTON

Engines

Economical Continuous Power—Diesels, Oil and Dual Fuel, and Spark-Ignition Gas Engines, from 190 to 2,100 bhp.

OVERSPEED GOVERNORS
and CIRCUIT CONTROL GOVERNORS



(Adjustable While Running)

PROTECT your engine and equipment from damage caused by overspeeding.

This INSURANCE costs so little for its protection that no power plant should be without it. Since 1932, SYNCHRO-START GOVERNORS and CONTROLS have been in use all over the world protecting and controlling power plants and many other types of machinery where circuits are to be made or broken at pre-determined speeds.

Write for bulletin No. 409 describing these proven controls. You can depend upon their rugged construction, design, and our many years' experience in this field. If you are a buyer of engines, specify SYNCHRO-START to your engine manufacturer. He will be glad to supply you with the controls best suited to meet your demand.

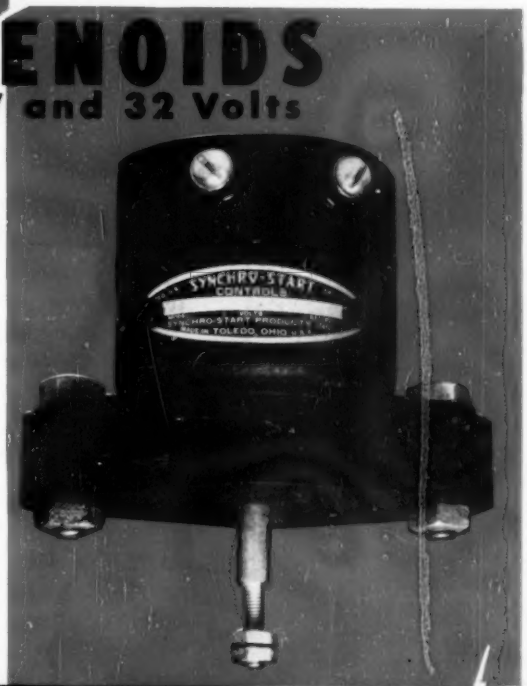
DC SOLENOIDS
6V—12V—24V and 32 Volts

(Continuous Duty)

This LITTLE GIANT is doing all sorts of jobs on engines and many kinds of machines. It has a ten pound pull and a half inch stroke.

It has many uses and can be used any place where an operation is desired. It is used for operating throttles, fuel pump racks, chokes, anti-Dieseling devices, valves, switches, and many other uses where automatic or remote control is desired.

Write for bulletin No. 410 describing this rugged control or for our latest catalog covering our complete line of SYNCHRO-START Automatic Controls which have been in use for the past seventeen years. You can't go wrong with SYNCHRO-START.



SYNCHRO-START PRODUCTS, INC.

Automatic Engine Control Equipment

8151 N. RIDGEWAY AVE. SKOKIE, ILLINOIS

MAXIM
SILENCERS

POSITIVE PROTECTION . . . of Health, Efficiency and Morale

Meet MR. NOISE, above, one of the most destructive and wasteful criminals to be found in industry today. He represents a very serious problem that affects the health, efficiency and morale of your own personnel, as well as others living within earshot of a noisy plant.

If Noise is the by-product of your industrial process, look to Maxim for advice and help.

Maxim has an unequaled record for eliminating Noise in thousands of plants throughout the world. They can do the same for you.

Sketch, above, courtesy of Safety Maintenance and Production.

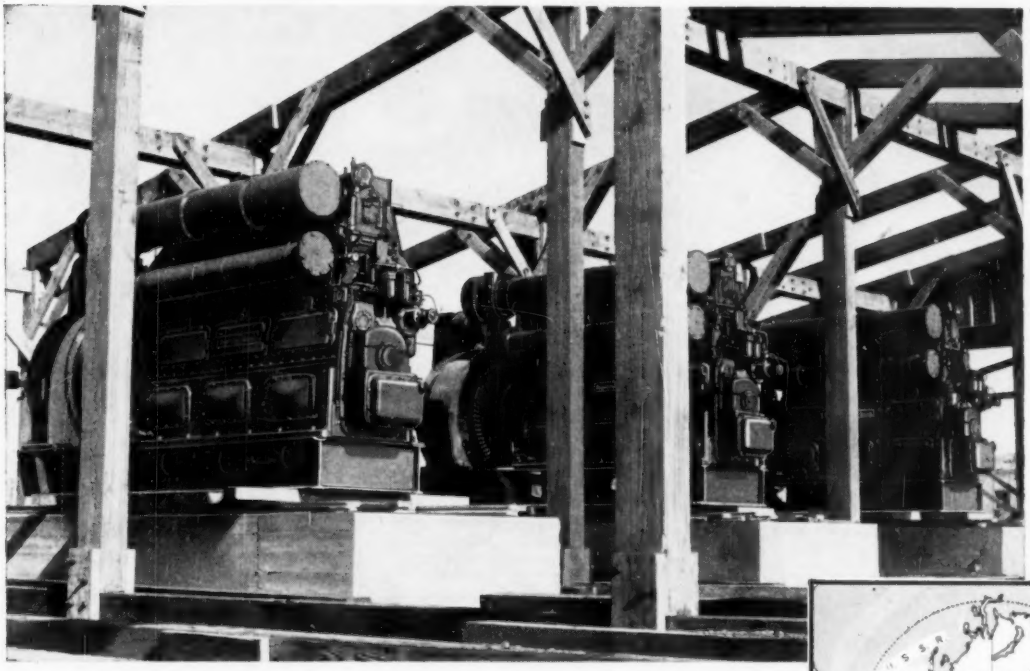
Maxim Silencers control exhaust noises caused by all types of internal combustion engines; cut noise and vibration on intake of engines or compressors, or wherever steam, air or gas must be exhausted at high velocities. Where extra heat is needed, Maxim Heat Recovery Silencers provide it at no extra cost for fuel by converting exhaust heat into usable steam or hot water. Where fresh water is a problem, Maxim Evaporators can be tied in with Heat Recovery Silencers or engine jacket water to provide efficient distillation.

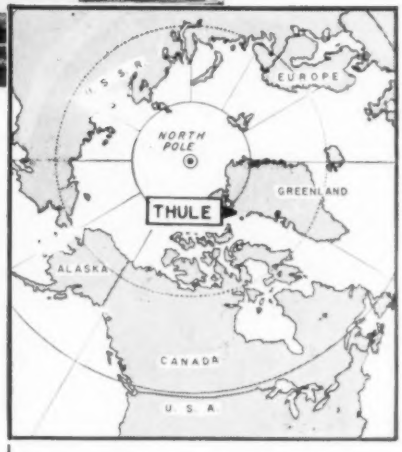
How can Maxim help you? If you have a silencing problem, remember . . . "Maxim can silence any noise that comes out of a pipe."

THE MAXIM SILENCER COMPANY
93 HOMESTEAD AVENUE, HARTFORD 1, CONNECTICUT

9MX54

Sitting on top of the world





Over 30 Ingersoll-Rand Diesel Engines generate electric power for north polar air base . . .

Here at Thule – civilization's northernmost outpost, only 900 miles from the pole – the fierce arctic winter is 8 months long, with temperatures of 50 below zero and hurricane winds up to 150 miles an hour! At an isolated outpost like this, the traditional *dependability* of Ingersoll-Rand diesel engines is a tremendous asset.

The engines generate electric power for the new 480 acre American air base at Thule. Three of them are shown above during construction of one of the power plants.

The engines were shipped completely assembled. Their *compact design* and low weight-to-horsepower ratio simplified handling and installation under very difficult conditions. Low fuel consumption, too, is an important consideration for a diesel engine installation such as at Thule. It's also one of the reasons why I-R diesels are repeatedly selected when *economy of operation* and *heavy-duty service* must be combined.

Ask your nearest Ingersoll-Rand engineer to tell you about the many other important advantages of I-R heavy-duty 4-cycle diesels – built in sizes from 200 to 900 hp.

946-7

Ingersoll-Rand
11 BROADWAY, NEW YORK 4, N. Y.

Construction of the diesel power plants at Thule was an ingenious solution to one tough problem called "perma-frost", a condition in which the earth a few feet below the surface is frozen to rock-like hardness. Ordinary building foundations were ruled out. The diesel-generator units were bolted to thick concrete slabs resting on piles set into the frozen ground. Buildings were constructed around them with floors laid on timbers above the ground. The underfloor air space insulates the building from the earth – and heavy concrete weights anchor the structures against the strong winds.

COMPRESSORS • ROCK DRILLS • AIR TOOLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

Make Your Own Hose Lines

AEROQUIP HOSE AND FITTINGS ARE MATCHED FOR GUARANTEED PERFORMANCE

● **No skill or special training is required to assemble Aeroquip Flexible Hose Lines by hand *in a matter of minutes!* YOU CUT COSTS because Aeroquip fittings are detachable and may be used again and again. YOU REDUCE INVENTORY because with Aeroquip bulk hose and a few fittings you can fill practically all your hose line requirements. YOU REDUCE DOWNTIME because with Aeroquip on hand, quick hose line replacements are available at all times.**

Cut hose to length with hacksaw; screw into socket.

Oil nipple and inside of hose liberally.

Screw nipple into socket and hose.

Install fitting on other end; hose line is ready for use.

Aeroquip

REG. TRADE MARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

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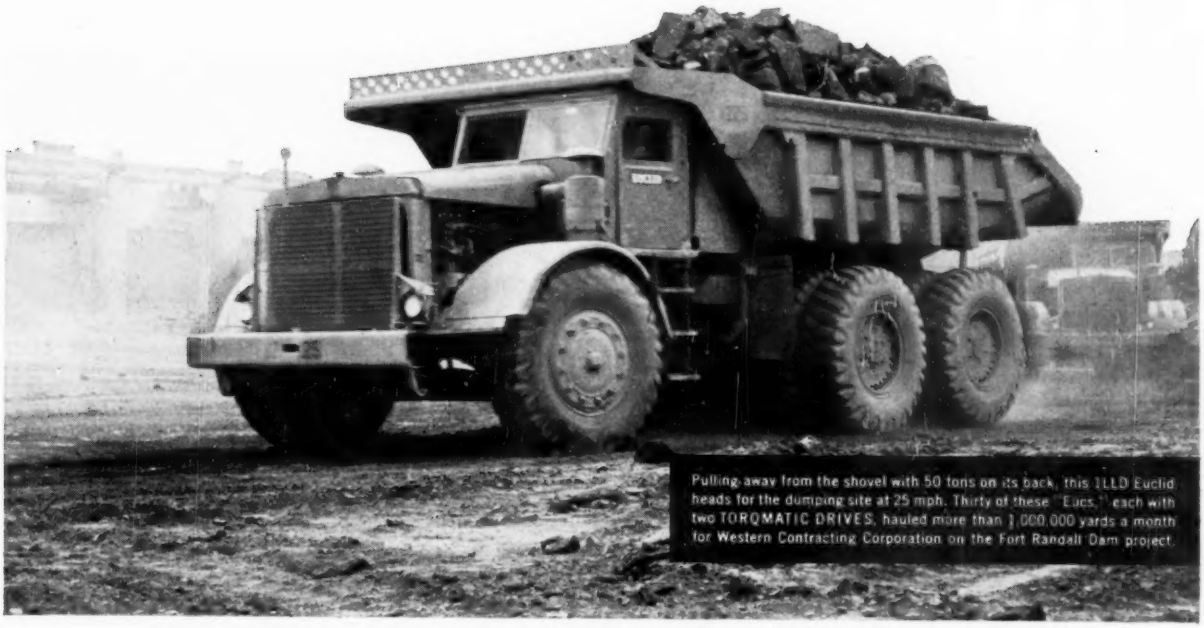
AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

By any yardstick —

Transmission Life up 100%



Pulling away from the shovel with 50 tons on its back, this 1LLD Euclid heads for the dumping site at 25 mph. Thirty of these "Eucs," each with two TORQMATIC DRIVES, hauled more than 1,000,000 yards a month for Western Contracting Corporation on the Fort Randall Dam project.

By any yardstick—miles, hours, ton-miles—truck transmissions *last twice as long* for Western Contracting Corporation since switching from direct-drive trucks to units equipped with Allison TORQMATIC DRIVES.

And "Rip" Collins, Project Manager, gives his TORQMATIC Converter-Transmission teams a major share of the credit for his perfect safety record in 1952: *No time lost due to accidents in 740,000 man-hours worked.*

Western's fleet of 30 Model 1LLD Euclids works 20 hours a day, 6 days a week. Making 700-900 trips per shift on a 3-mile round-trip run, these "Eucs" have hauled 6½-million yards of earth in six months' time. They climb 20% grades with 50 tons on their backs.

The TORQMATIC Converter absorbs harmful shock loads, protects drive lines, transmissions, differentials and other truck components. With no clutch pedal to push and only 3 forward speeds—instead of the usual 7 or 10—drivers quick-shift at full throttle and keep their eyes on the road, not on the gearshift.

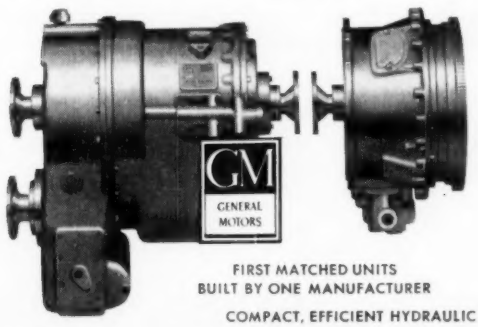
If you are in the earthmoving business, do it better and at less cost with Allison TORQMATIC DRIVES in your units. Ask your equipment dealer, manufacturer or write:

Allison Division of General Motors
Box 894S, Indianapolis 6, Indiana

ALLISON TORQMATIC DRIVES

Unbeatable Team for Maximum Operating Economy

- **Quick-Shifts** at full throttle with finger-tip hydraulic control
- **Holds power to load** at all times—no clutch pedal to push—no gearshift guess
- **Reduces maintenance costs** by absorbing shock—eliminates engine lugging—prolongs equipment life
- **Only** torque converter-transmission team designed to work as a *unit* and built by one manufacturer
- **Cuts** driver training costs



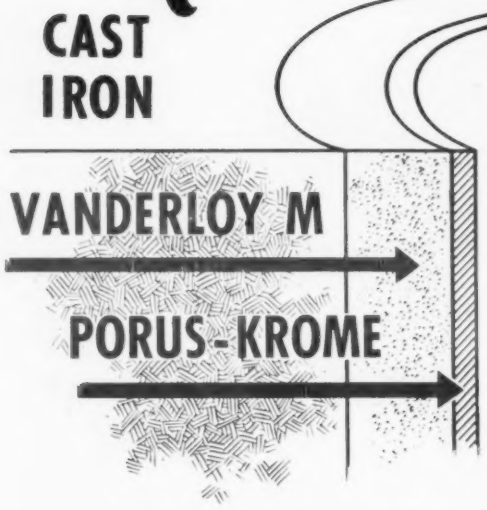
FIRST MATCHED UNITS
BUILT BY ONE MANUFACTURER

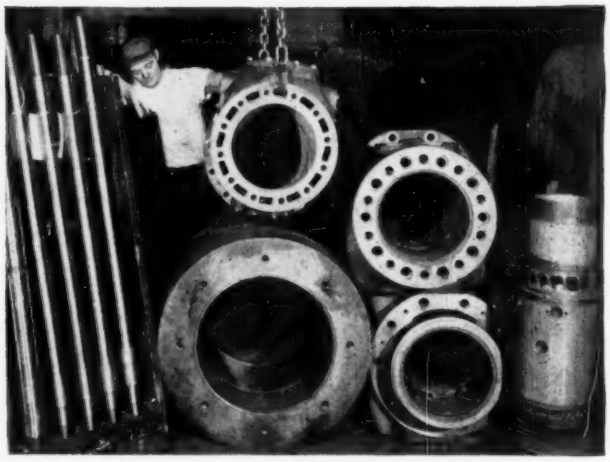
Allison

TORQMATIC DRIVES

COMPACT, EFFICIENT HYDRAULIC DRIVES FOR CRANES • TRUCKS • TRACTORS • SCRAPERS • SHOVELS • DRILLING RIGS

Reverse the Wear...





VAN DER HORST
TRADE MARK

* *PORUS-KROME is a dense, hard, wear and corrosion-resistant chromium, produced by the Van der Horst Corporation of America, and which gives working surfaces an infinite number of tiny oil-retaining reservoirs for perfected lubrication.*

U. S. PATENTS
2,048,578, 2,314,604 and 2,412,698

Why bother to have your liners oversized? Reverse the effects of wear — have your liners Van der Horst processed!

With VANDERLOY M we can plate back any liner you have to original size — and with PORUS-KROME* we can keep it that way.

A PORUS-KROME liner outwears as many as four unprocessed liners. Meantime, it uses less lube and fuel oil, delivers more power and is much easier on rings.

When such liners finally need replacing, simply slip in another set of Van der Horst Re-STANDARD-Sized liners — and send the worn ones back to us for renewal again.

Even liners you'd normally scrap are restored to original dimensions and each renewal pays pays for itself — several times over.

Of course the real profit comes when you eliminate the cost of stocking oversize parts — simply by having Van der Horst "reverse the wear" on all your liners. Let us show you how much can be saved by making this your standard practice.

W52-3D

VAN DER HORST CORPORATION • OLEAN, N. Y.

GM DIESEL
CASE HISTORY No. 639-51

USER: Geo. M. Brewster & Son, Inc., Bogota, N. J.

INSTALLATION: Four GM Diesel-powered Ingersoll-Rand Gyro-Flo 600 compressors supplying air for 9 I-R 71 wagon drills.

PERFORMANCE: "Completely satisfactory," says operator Tom Malone. Units shown were delivering air to the tools through 1200 to 1600 feet of line--maintaining steady pressure of 100 to 110 psi.

It pays to STANDARDIZE on

GM
GENERAL MOTORS
DIESEL POWER

2400 CUBIC FEET OF AIR PER MINUTE ON NEW YORK THRUWAY ROCK CUT

Geo. M. Brewster & Son now operate a total of 18 General Motors Diesel-powered Gyro-Flo compressors, including this battery of four capable of supplying 2400 cubic feet of air per minute for rock drills on a section of the New York Thruway, near Kingston.

These modern rotary compressors take full advantage of GM Diesel's smoother-running 2-cycle operation to maintain a steady flow of nonpulsating air at 100 psi or better. And compactness of the GM 2-cycle design makes these units smaller and lighter for quick, easy movement from job to job.

This inherent engine design superiority—plus interchangeability of lower-cost parts, readily available through a world-wide GM Diesel service organization—explains why GM Diesel power is a favorite of contractors on so many jobs. Next time you order equipment, it will pay you to specify GM Diesel. Available as original or replacement power in more than 750 different models of equipment. Write us for complete list.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines . . . 16 to 275 H.P. Multiple Units . . . Up to 840 H.P.

...with TYCOL lubricants on hand!

Take heavy mechanical equipment, for instance. There's a Tycol lubricant for any application you name: For instance, what about steam turbines? . . . Tycol Aturbrio oils resist heat and sludging, are "double inhibited" to provide the utmost resistance to rust and oxidation. Diesels? . . . Tycol Adelbus oils contain additives that produce a tough "film of protection" and help to eliminate sludge and varnish. You always get top performance with Tycol lubricants. Why? . . . Because each Tycol grease and oil is manufactured from high quality base stocks and *tailored* for a specific application. Get the full story of the entire Tycol line from your local Tide Water Associated office today!

Over 300 Tycol industrial lubricants are at your disposal . . . engineered to fit the job!

REFINERS AND MARKETERS OF VEEDOL . . . THE WORLD'S MOST FAMOUS MOTOR OIL

TYCOL
INDUSTRIAL LUBRICANTS

Boston • Charlotte, N. C. • Pittsburgh
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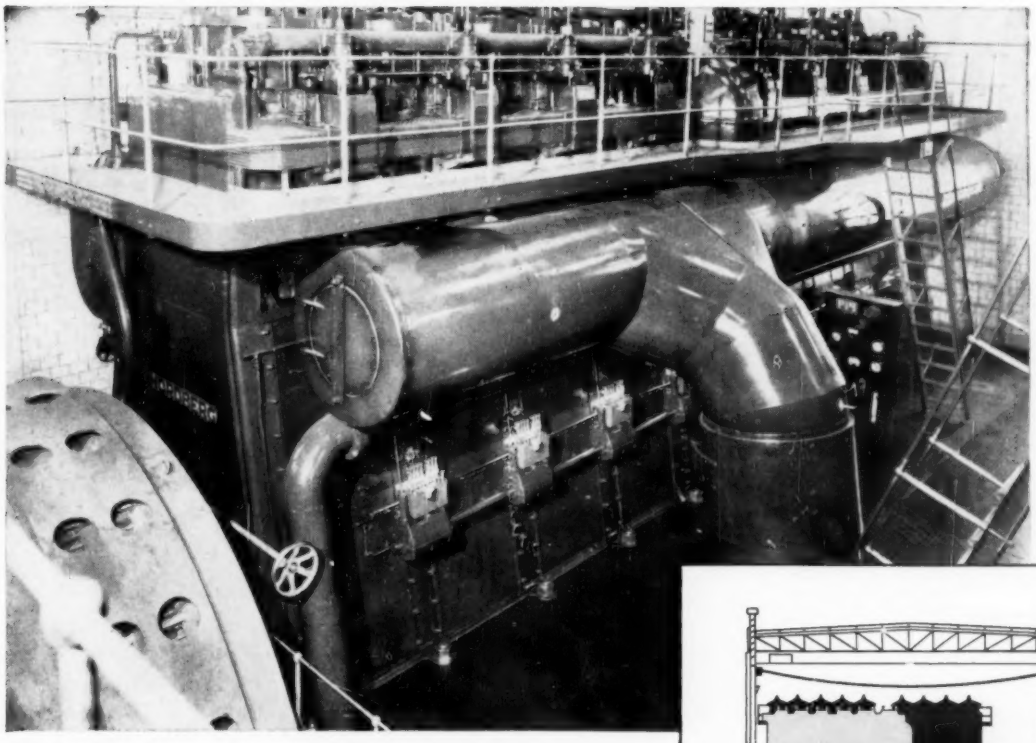
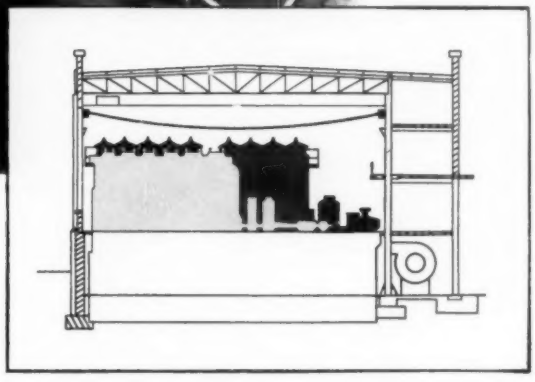
TIDE WATER ASSOCIATED OIL COMPANY
17 BATTERY PLACE . NEW YORK 4, N. Y.



Shown here is the fourth large, heavy duty oil burning Nordberg 2-cycle Diesel to be installed in the Grand Haven plant . . . a 7000 hp, 5000 kw unit.



Outstanding economy and reliability of NORDBERG two-cycle DIESELS proved in 15 years of Municipal Power Expansion

Experience of the City of Grand Haven, Michigan, is evidence of the ability of Nordberg Diesel Engines to meet ever-increasing power requirements.

Starting over fifty years ago with a modest steam engine plant, Grand Haven has progressed through turbines, smaller internal combustion engines, and, in the last 15 year period, to the use of large Nordberg 2-cycle Diesels, ranging from 2250 to 7000 hp, as their main power supply. Their recent selection of a fifth Nordberg unit provides further proof of the outstanding reliability of these low speed, heavy duty engines.

It is important to note that the established economy of Nordberg Diesels is further enhanced in the Grand Haven plant through their ability to operate efficiently and economically on heavy, straight-run residual fuel oils. Operating records, covering over a year's operation show, for example, that the 7000 hp Nordberg Diesel has been producing power for an impressive 14.16 kwh / gal. of fuel.

This is another good example of the varied power problems being solved better, more economically with Nordberg Diesels.

MODERN DIESEL POWER GREATLY INCREASES PLANT CAPACITY

Not only has modern Diesel power brought excellent fuel economy to Grand Haven, but it has also given the plant six times as much power installed in a given building section.

The expansion that provided room for the last Nordberg engine, a 7000 hp unit, is almost identical in area to that occupied by any one of the three original 1140 hp Diesel engines.

NORDBERG MFG. CO.
Milwaukee, Wisconsin

NORDBERG

DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

P953

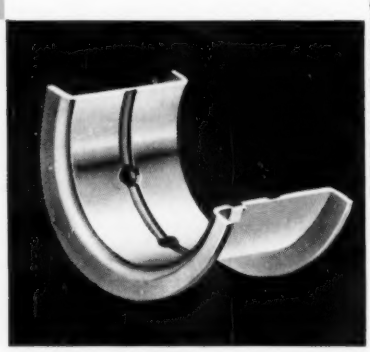
What makes a

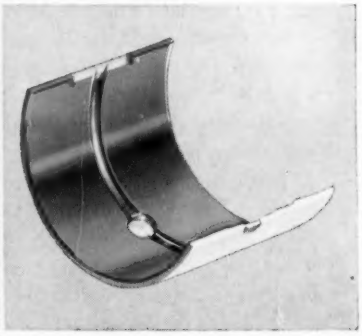
DEPENDABLE SOURCE

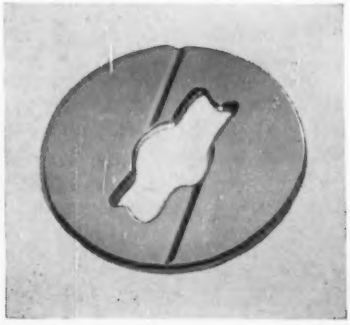
of bearing supply for you?

. . . it's management that is sensitive to your problems and requirements . . . it's enterprising research . it's resourceful engineering . . . it's dependable production . . . it's a record of over 50 years' growth through conscientious service. Your inquiry is invited.

This useful reference catalog on all types of sleeve bearings, bushings, precision bronze parts, washers and spacer tubes is sent free, on your letterhead request.







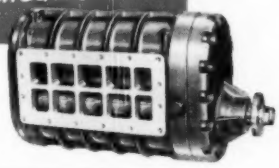
FEDERAL-MOGUL FEDERAL Mogul since 1899

FEDERAL-MOGUL CORP., 11041 SHOEMAKER, DETROIT 13, MICH.

here's why MIEHLE-DEXTER SUPERCHARGERS put more horsepower in so many LEADING DIESEL ENGINES

Miehle-Dexter supercharged equipment bulldozes rock and overburden in an open-pit copper mine. Result: operators report more production, lower cost per cubic yard of material handled, reduced maintenance cost.

MIEHLE-DEXTER *boosts horsepower up to 50% or more in engines used on all these applications...*



TRACTORS

BUSES

CONSTRUCTION EQUIPMENT

TRUCKS

MARINE

STATIONARY PLANTS

MIEHLE-DEXTER SUPERCHARGERS give you 4 big engineering advantages

Around ore fields and coal mines, on construction jobs and in quarries . . . wherever the going is rough and rugged . . . you'll find Miehle-Dexter supercharged equipment.

Here's why: (1) Internal construction uses patented rubber grid seals, vulcanized to metal end plates. This eliminates metal-to-metal contact, assures long service life and achieves fuel savings. (2) Lightweight aluminum parts boost power without adding weight. (3) Special wear strips permit practically zero clearance between rotor lobes and housing, eliminating metal-to-metal contact and assuring longer wear. (4) Standardized parts allow easy field service.

You, too, can register big gains in horsepower while reducing weight per horsepower. The investment is usually far less than required by other methods. Write now for technical bulletin.

MIEHLE-DEXTER SUPERCHARGER

DIVISION OF THE DEXTER FOLDER COMPANY

100 Fourth Street • Racine, Wisconsin

Trust M-D Superchargers for internal combustion engines . . . not them for blower and air compressor operations, too.

P&H Diesel Engines

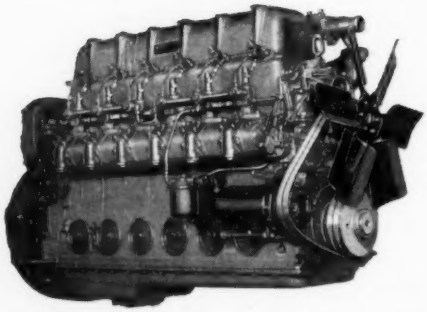
(2-CYCLE)

Can your diesels match this torque curve?

This is the torque curve for the P&H Model 687-C Diesel Engine. Note how the torque characteristics are sustained throughout its entire horsepower range.

That means steady, responsive power at all speeds — greater lugging "ability" for those toughest jobs. It's the kind of unfaltering performance that assures more profits in any service, constant or intermittent.

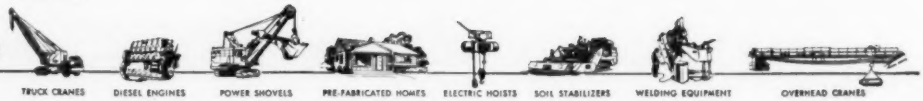
Steady torque for steady work is just another outstanding feature of P&H Diesel Engines — America's most advanced line. Ask your P&H Diesel representative for the full story. Or write for literature.



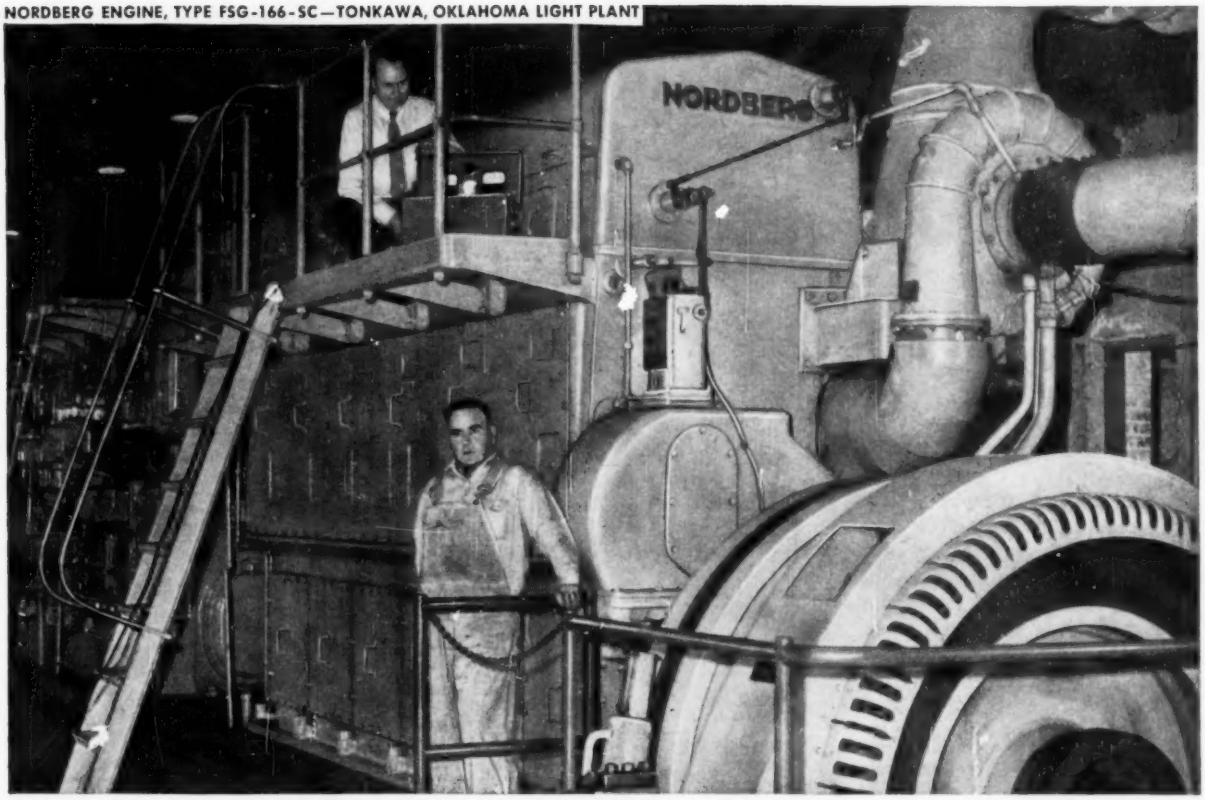
P&H Diesel Engines are built in 1, 2, 3, 4 and 6-cylinder models — up to 145 h.p.

P&H DIESEL DIVISION
HARNISCHFEGER CORPORATION
CRYSTAL LAKE, ILLINOIS

the P&H *Line*



NORDBERG ENGINE, TYPE FSG-166-SC—TONKAWA, OKLAHOMA LIGHT PLANT



30,000 HOURS, NO WEAR!

MICROMETER MEASUREMENTS			
LINER MEASUREMENTS		WITH CRANK	90° TO CRANK
#1 Liner	Top	16.004"	16.008"
	4" down	.003"	.006"
	8" down	.0035"	.007"
#2 Liner	Top	16.003"	16.002"
	4" down	.002"	.001"
	8" down	.001"	.0005"
#3 Liner	Top	16.005"	16.007"
	4" down	.004"	.006"
	8" down	.003"	.008"
#4 Liner	Top	16.003"	16.004"
	4" down	.004"	.005"
	8" down	.001"	.002"
#5 Liner	Top	16.004"	16.000"
	4" down	.003"	.000"
	8" down	.003"	.001"
#6 Liner	Top	16.003"	16.0015"
	4" down	.0015"	.0015"
	8" down	.0015"	.0005"
(Original machine shop tolerance—16" plus or minus .001")			

No Wear On Rings Or Liners With Great Cities Service Diesel Oils!

When the Tonkawa City people pulled this Diesel off the line for periodical inspection, it had logged 30,038 hours and was approximately six years old. After they had the engine torn down, micrometer measurements were taken on the cylinder liners. THEY COULD FIND VIRTUALLY NO APPRECIABLE WEAR ON RINGS OR LINERS!

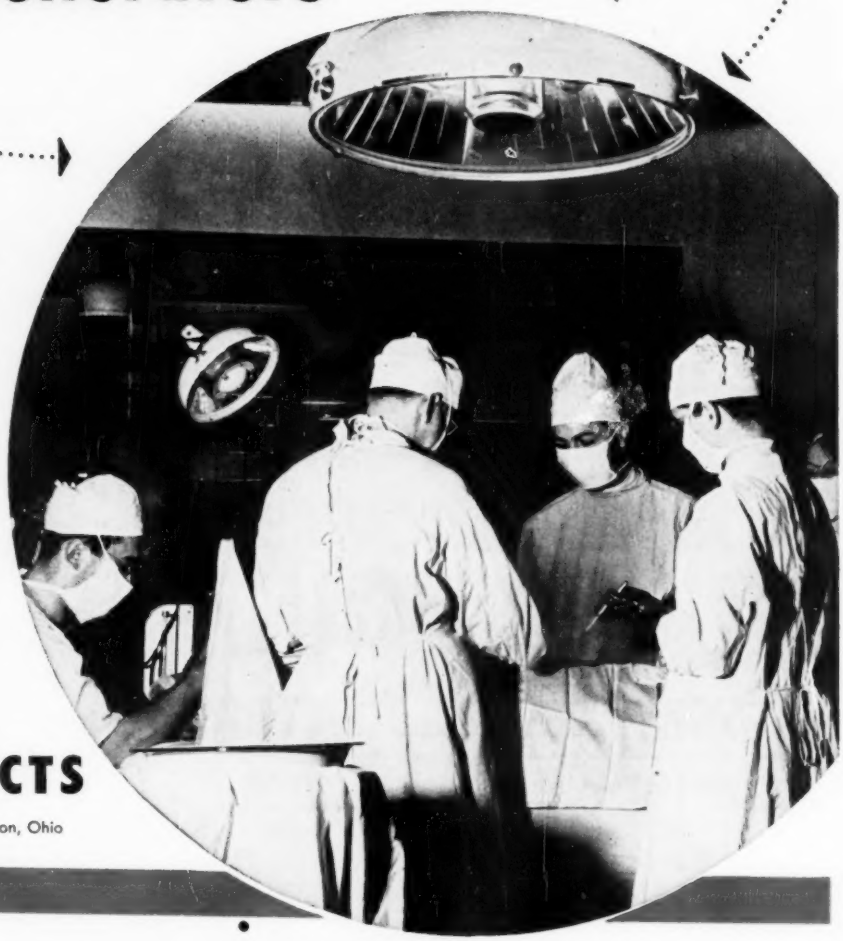
They were so amazed that they had another man in the plant take his own micrometer readings. Still not certain that an engine could run that long with so little wear, they had the micrometer itself checked! The instrument checked out perfectly!

Men who have worked with Diesel Engines all their lives have said that they've never seen an engine with that much time in service with so little wear. Obviously, a great deal of the credit must go to the maker of these splendid engines, but also, credit must be given to the high-quality, wear-reducing Cities Service Diesel Oils used in this engine. You'd be wise to buy yourself this kind of inexpensive diesel-engine protection too. Call your nearest Cities Service Office or write Cities Service Oil Company, Sixty Wall Tower, New York City 5, N. Y.

CITIES SERVICE
QUALITY PETROLEUM PRODUCTS

For stand-by power

Delco Generators



Delco generators are designed to serve Diesel power plants effectively . . . and without fail. With a power range of 20 kw through 200 kw, AC and DC, 1200, 1500, and 1800 rpm, Delco generators have kept pace with Diesel engineering.

Hospitals, schools, public buildings, carnivals, circuses and outside construction jobs frequently call for power from an independent source. At such times Delco generators, time and again, prove their dependability for stand-by or portable service. Any of the sales offices listed below will be glad to supply detailed information.

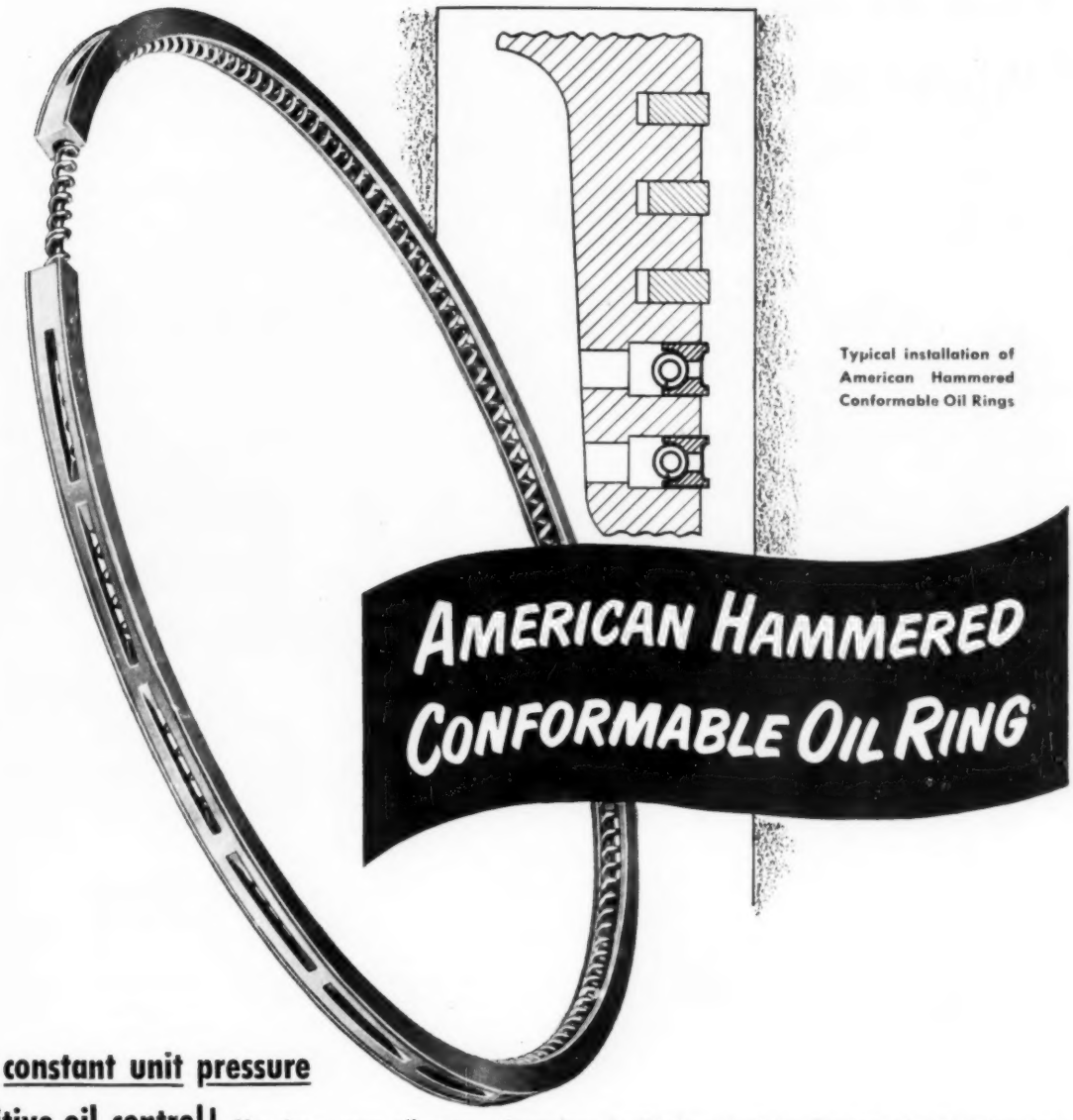
DELCO PRODUCTS

Division of General Motors Corporation, Dayton, Ohio

AC GENERATORS
20 kw through 150 kw at 1200 rpm
20 kw through 200 kw at 1800 rpm

DC GENERATORS
20 kw through 90 kw at 1800 rpm
20 kw through 75 kw at 1500 rpm
20 kw through 60 kw at 1200 rpm

SALES OFFICES:
ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • HARTFORD • PHILADELPHIA • ST. LOUIS • SAN FRANCISCO



Typical installation of American Hammered Conformable Oil Rings

AMERICAN HAMMERED CONFORMABLE OIL RING

Insures constant unit pressure for positive oil control!

You keep your oil consumption down when you install Koppers American Hammered Conformable Oil Rings! This service-tested piston ring conforms readily to meet cylinder distortion because its flexible cast iron member is pressed outward by an abutment type spring which exerts uniform radial pressure around the entire circumference.

Narrow bearing surfaces on either side of the channel give the ring a uniform unit pressure on the cylinder, enabling it to seat promptly and assuring maximum removal of excess oil throughout its lifetime. And the Conformable Oil Ring has a longer useful life because its low spring rate and uniform lands result in negligible changes in pressure as the ring wears.

Easily installed, it is ideal for both 2-cycle and 4-cycle Diesel & Gas engines; comes in 4" to 25" diameters with a minimum width of ¼". Write, wire or phone us today for full information on how the Conformable Oil Ring can improve *your* operation . . . or for expert help in *any* piston or sealing ring problem. KOPPERS COMPANY, INC., *Piston Ring Dept.*, 1549 Hamburg Street, Baltimore 3, Maryland.

KOPPERS®

METAL PRODUCTS DIVISION • KOPPERS COMPANY, INC. • Baltimore, Maryland

This Koppers Division also supplies industry with Fast's Couplings, Aeromaster Fans, Koppers-Elex Electrostatic Precipitators and Gas Apparatus.

Engineered* Products Sold with *Service

AMERICAN HAMMERED *Industrial Piston Rings*

KOPPERS COMPANY, INC., *Piston Ring Dept.*, 1541 Hamburg Street, Baltimore 3, Md.

Gentlemen: Please send me full information on your Conformable Oil Ring.

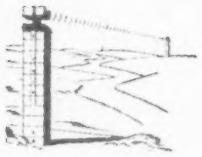
Name .....

Company .....

Address .....

City ..... Zone ..... State .....

if your job requires:

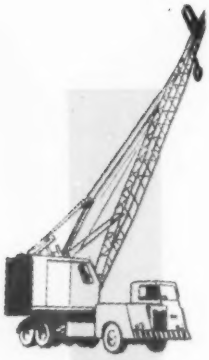


DEPENDABLE service

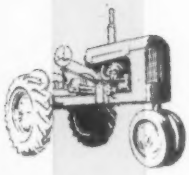
SMOOTH power

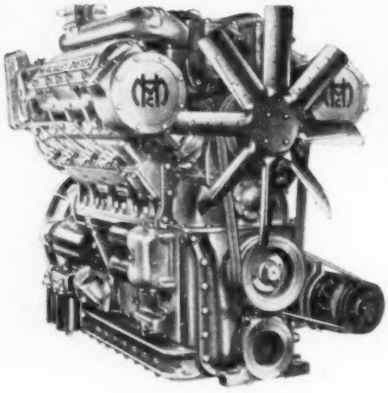
ECONOMICAL operation

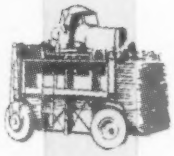
specify



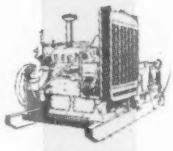
HERCULES DIESELS







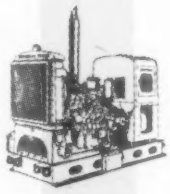
THE WIDE ACCEPTANCE of Hercules lightweight, high-speed, heavy-duty diesel engines is the result of sound engineering principles and engine building "know-how."



This wide acceptance has gained an enviable reputation for Hercules diesel engines throughout all phases of industry which has resulted in many diversified applications in the automotive field . . . agricultural industry . . . construction industry . . . industrial service . . . oil field service . . . marine use and many others.

There are 29 models of Hercules diesel engines, built in a broad range of sizes and displacements from 12 to 500 horsepower. Hercules diesel engines are available with either automotive mounting or as closed, open or base type power units and are parallel in mounting dimensions and performance with Hercules gasoline engines of similar displacement.

For power requirements such as those illustrated or other applications where dependable service, smooth power and economical operation are important factors—specify Hercules diesel engines—produced by engine specialists who have been designing and producing engines to industries specifications for over 36 years. *If you have a special power problem, write the factory or call in a Hercules sales-engineer.* We will be glad to discuss your power requirements with you. No obligation, of course.



TWO CYLINDER

Model	Bore and Stroke Inches	Piston Displ. Cubic Inches	Max. H.P. at R.P.M.	Max. Torque at R.P.M.
DIXC	4" x4½"	112.1	27.6 @ 1900	81 @ 1400
DIXD	4¼" x4½"	127.5	30 @ 1900	91 @ 1300

FOUR CYLINDER

DIX4B	3⅛" x4"	133	46 @ 3000	96 @ 1500
DIX4D	3⅜" x4"	166	57 @ 3000	120 @ 1500
DOOB	3⅜" x4½"	198.8	62 @ 2600	142 @ 1400
DOOC	4" x4½"	226.2	70 @ 2600	162 @ 1400
DOOD	4¼" x4½"	255	79 @ 2600	183 @ 1400

SIX CYLINDER

DIX6D	3⅜" x4"	248	93 @ 3000	186 @ 1800
DJZB	3½" x4½"	260	77 @ 2600	178 @ 1300
DJXC	3⅝" x4½"	298	83 @ 2600	208 @ 1300
DJXM	3⅝" x4½"	298	99 @ 2600	234 @ 1400
DJXMF	3⅝" x4½"	298	99 @ 2600	234 @ 1400
DWXC	4" x4⅝"	358	120 @ 2600	276 @ 1500
DWXD	4¼" x4⅝"	404	135 @ 2600	315 @ 1600
DWXLD	4¼" x5"	426	142 @ 2600	328 @ 1600
DWXLDF	4¼" x5"	426	142 @ 2600	311 @ 1500
DRXB	4⅝" x5⅛"	474	133.8 @ 2200	360 @ 1200
DRXC	4⅝" x5⅛"	529	147 @ 2200	400 @ 1100
DFXB	5" x6"	707	190 @ 2100	530 @ 1250
DFXC	5⅛" x6"	779	204 @ 2100	585 @ 1250
DFXD	5½" x6"	855	217 @ 2100	643 @ 1250
DFXE	5⅝" x6"	893	228 @ 2100	685 @ 1250
DFXH	5⅝" x6"	935	260 @ 2100	750 @ 1200
DFXHF	5⅝" x6"	935	260 @ 2100	750 @ 1200

EIGHT CYLINDER

DHXV-BC	4" x6"	1348	365 @ 2100	1010 @ 1200
DHXV-BD	4¼" x6"	1468	400 @ 2100	1100 @ 1200
DHXV-BDS	4¼" x6"	1468	300 @ 2100	1330 @ 1200

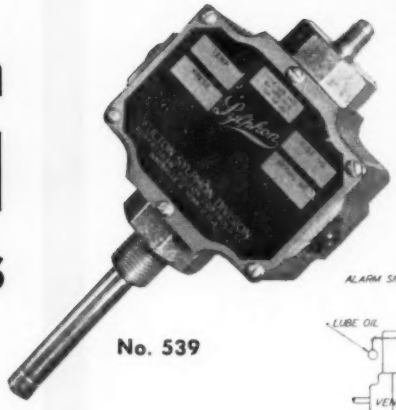
HERCULES MOTORS CORP. • Canton, Ohio, U. S. A.

Engine specialists since 1915

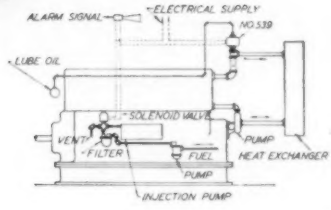
Why take chances on engine trouble?

No. 923-3

Depend on SYLPHON controls



No. 539



Typical installation of No. 539.

YOU NEVER NEED to cross your fingers—or trust to luck—with these Sylphon controls. When they're on the job, they safeguard you against engine trouble—day and night. They help ward off costly shutdowns, damage or repairs.

No. 539 control gives positive protection against high jacket water temperature or low lube oil pressure. If water jacket temperature goes above, or lube oil pressure goes below safe limits, it sounds an alarm—or shuts off the engine. Also available for temperature or pressure only.

No. 923-3 Regulator is equally dependable. It thermostatically controls cooling water circulation—keeps engine jacket temperature right. Can be manually operated—if and when desired!

Both controls are ideally suited to diesel, gas or other internal combustion engines. Self-contained and self-powered, they're built to give you long, trouble-free service. Easily installed. For complete information, send for Bulletin AD-817.

Robertshaw-Fulton
CONTROLS COMPANY

FULTON SYLPHON DIVISION

Temperature Controls • Bellows Devices • Bellows Assemblies

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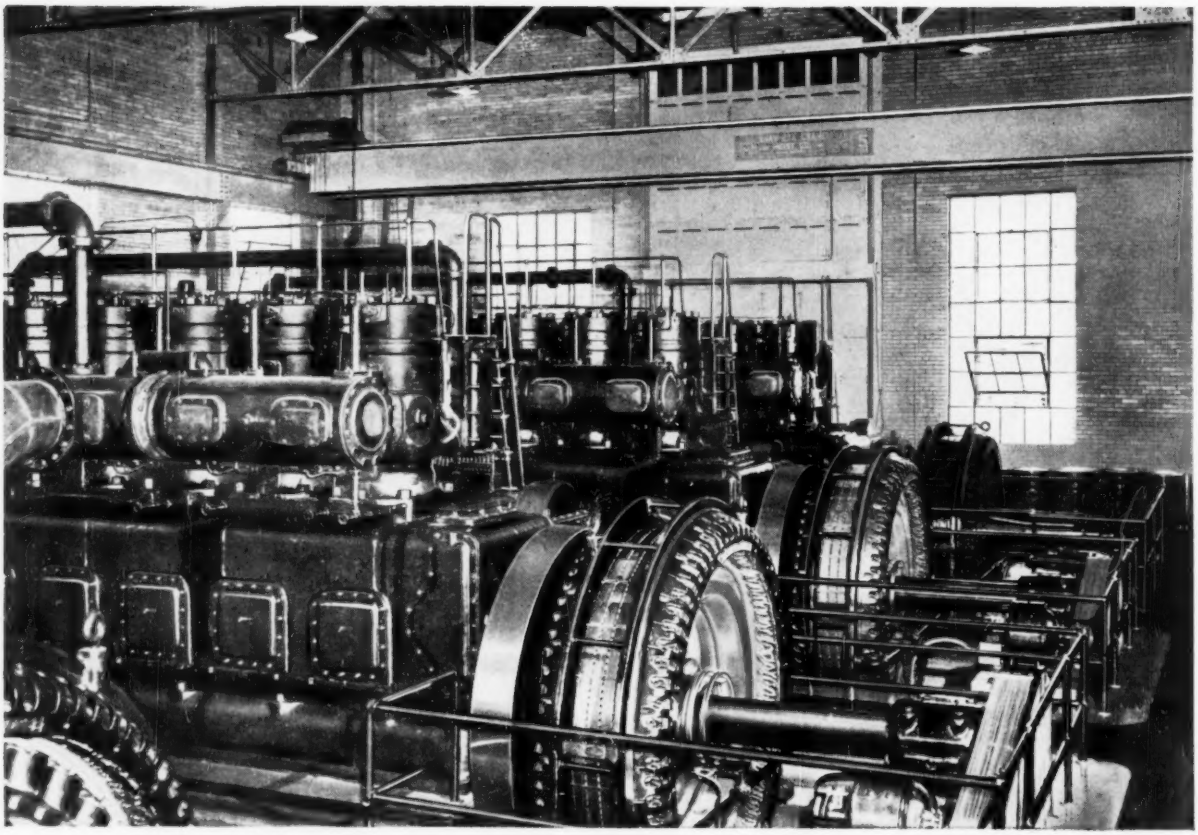


"We're Proud of This Plant!"

says Don H. Decker, — Plant Supt., Thumb Electric Cooperative, Ubly, Mich.

Manager Orville Hurford and Mr. Decker are justifiably proud of their 4-diesel engine generating station. The plant has been an outstanding financial success since the day it was first opened. Several times it has occupied #1 position on the REA Running Plant capacity chart.

Mr. Decker writes, "A large part of our operating success we attribute to Sinclair GASCON® D oil. It has given us an excellent rate of consumption while reducing wear. In fact, *cylinder and piston ring wear is much below normal based on other plants of equal capacity*. Something else we appreciate is the timely visits of the Sinclair Lubrication Engineers."

Top quality lubricants plus the assistance of Sinclair Lubrication Engineers are two of the reasons why Sinclair can play a large part in the success of *your* operation. Your local Sinclair Representative will be happy to explain the remaining reasons. Phone him or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

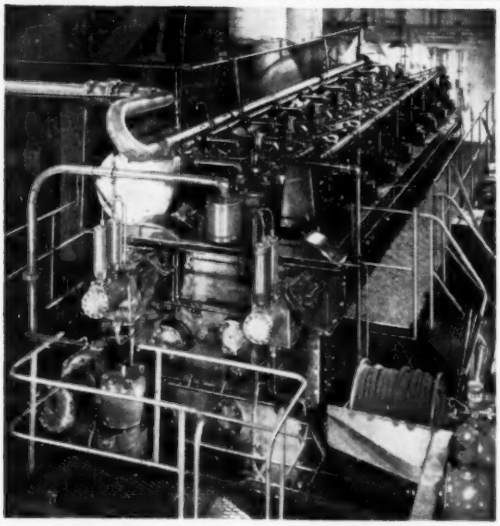
SINCLAIR DIESEL LUBRICANTS

save Wear and Replacement

Captain E. C. Baganz of M.S. Eugene W. Pargny reports:

"Our new Hamilton Diesel engine gives us enough added power and maneuverability to cut trip time 10%"

Here is Captain E. C. Baganz on the bridge of Pittsburgh Steamship's ore carrier M.S. Eugene W. Pargny which is shown below in service on the Great Lakes. It normally carries 14,000 long tons of ore from the head of Lake Superior to Lake Michigan or Lake Erie Ports and returns light.



Pictured above is the 2-cycle, 8-cylinder, single acting, direct reversible Hamilton Diesel engine which replaced a less efficient 2050-hp jet-condensing, triple-expansion steam engine in 1951.

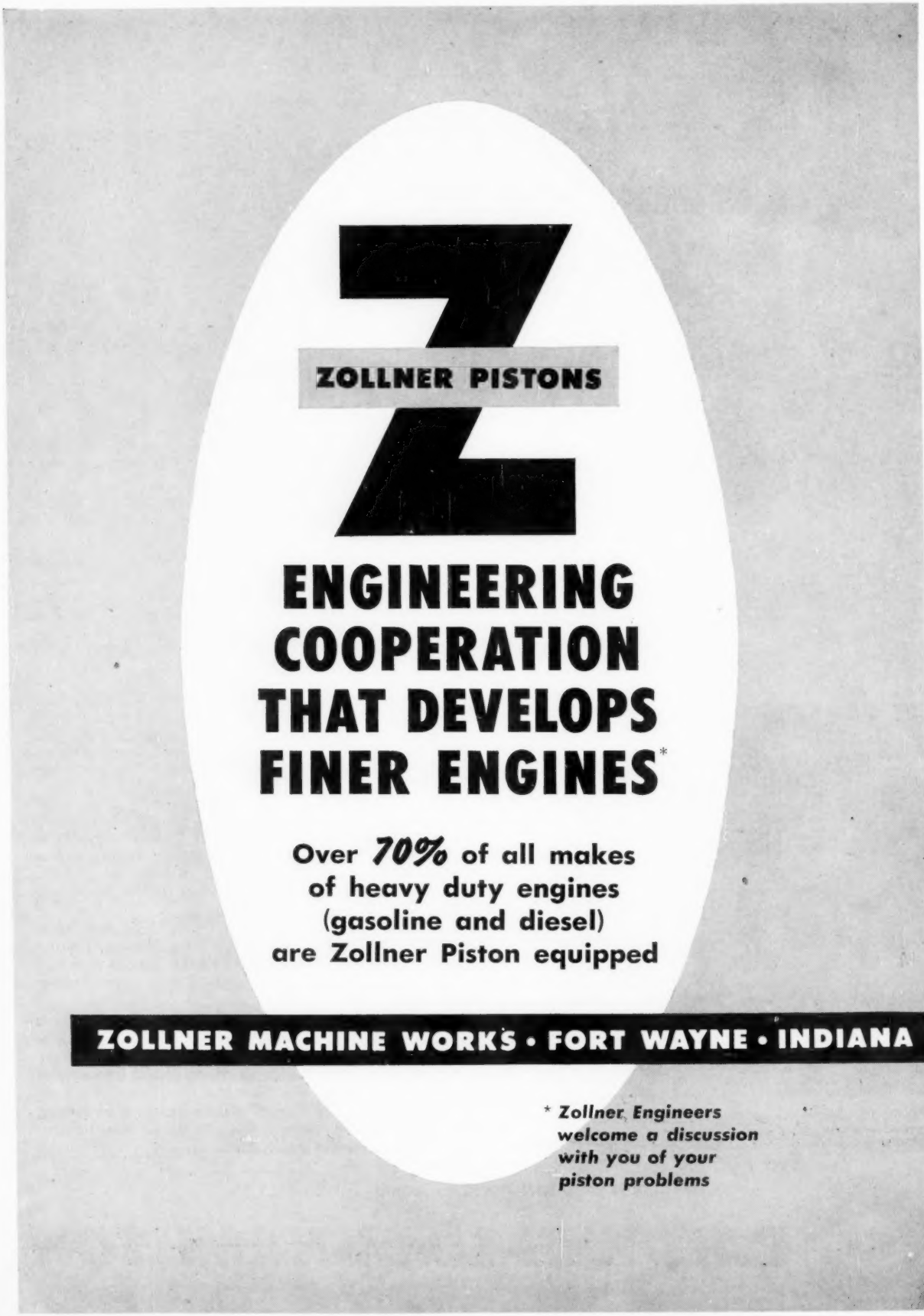
Greater operating efficiency and maneuverability are two big advantages a Hamilton Diesel engine has given Pittsburgh Steamship during two years of service in their 600-foot ore carrier, Eugene W. Pargny. According to Captain E. C. Baganz, the 3570-hp, 21½ x 27½ Hamilton has made a "new ship" out of the 35 year old Pargny:

"MANEUVERABILITY is of prime importance to us, particularly when we must get the long, narrow ship through holes in breakwaters under severe, high wind storm conditions. The new Hamilton engine makes it a lot easier for us because it gives us more power ahead and astern.

"ECONOMICAL OPERATION of the Hamilton Diesel benefits us two ways. By substantially increasing our normal speed and maintaining a higher average speed it is enabling us to make more round trips to the ore fields per season compared with our previous average. Another advantage is the Hamilton Diesel's ability to burn any of the heaviest fuel oils. Except for short periods when starting or maneuvering in close quarters, this engine has been burning heavy residual fuels without unusual difficulty."

HAMILTON DIVISION, Hamilton, Ohio

BALDWIN-LIMA-HAMILTON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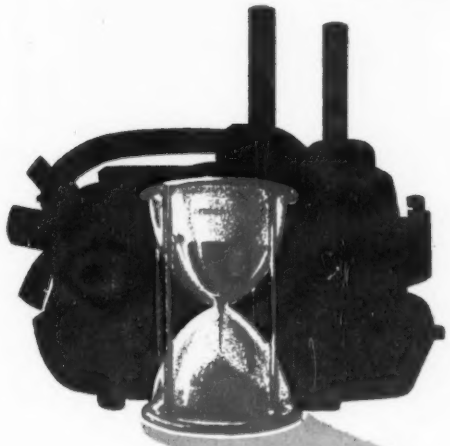
ENGINEERING COOPERATION THAT DEVELOPS FINER ENGINES*
Over 70% of all makes of heavy duty engines (gasoline and diesel) are Zollner Piston equipped
ZOLLNER MACHINE WORKS • FORT WAYNE • INDIANA
* Zollner Engineers welcome a discussion with you of your piston problems

STRETCH ENGINE WORK HOURS WITH A UNITED OIL BATH AIR CLEANER



United Oil Bath Air Cleaner used on diesel engine powering 20-ton crawler tractor.

You can add hundreds of hours of operation to an engine by installing a United Oil Bath Air Cleaner. Here's why. Efficient United Air Cleaners prevent over 99 percent of airborne dust from entering the engine — protect rings, pistons, sleeve bearings from excessive wear.

Back of United are over 30 years of air cleaner experience. Time-tested United Oil Bath Air Cleaners have proved their worth on thousands of diesel engines used for powering trucks, tractors, road machinery, stationary and portable power units.

Experienced United Specialties sales engineers can help you with up-to-the-minute counsel on problems relating to the design and use of oil bath air cleaners. Write for complete details.

UNITED SPECIALTIES COMPANY

United Air Cleaner Division — Chicago 28 — Mitchell Division — Philadelphia 36 — Birmingham 11, Alabama

AIR CLEANERS ★ METAL STAMPINGS ★ ROLLED SHAPES
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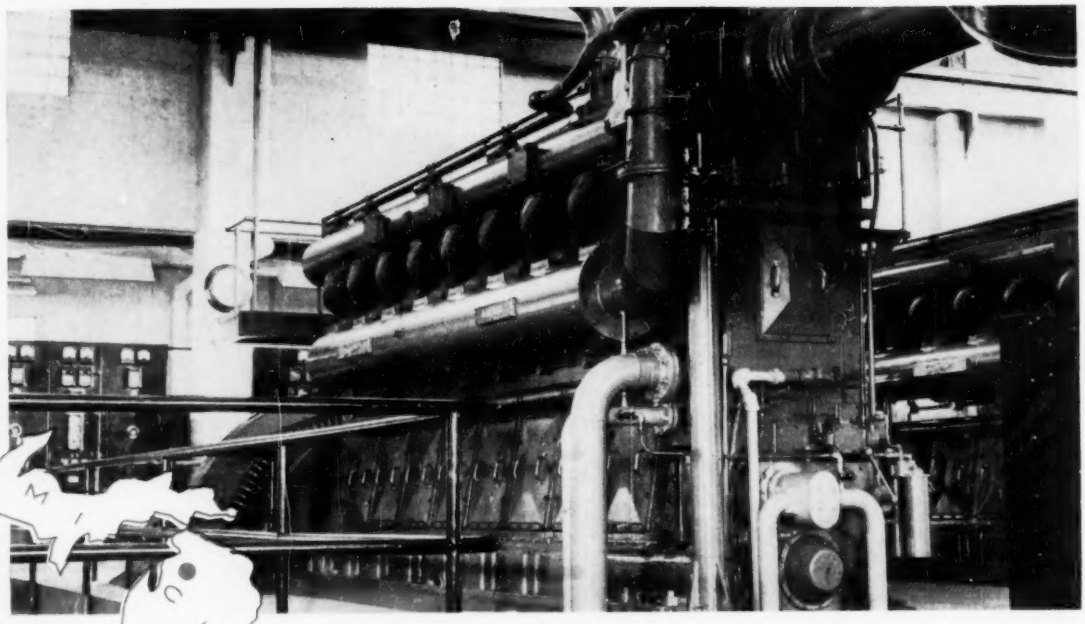

Petoskey, Michigan meets growing power demands with a 4th SUPERIOR DIESEL

...Profits gained from 3 present Superior Diesels pay for it!

Petoskey, Michigan, had sufficient power for the first time in many years when it installed 3 Superior Diesels in a new $570,000 power plant in 1948. At that time, city officials and engineers, wisely planning for possible future power loads, allotted engine room space for expansion.

Their foresighted planning is really paying off—for Petoskey's power requirements have increased 27.5% since 1948 and kept the first 3 Superiors in full operation. The addition of the new 1765 HP Superior now provides the extra margin of power needed to easily handle the normal daily peak load.

The most important fact about the Petoskey plant is that the city is paying for this new Superior from profits made possible by the original three installed. The city's experience with Superior performance in providing economical power through several years of near-peak loads quite naturally led to the choice of this new engine for extra power demands.

In thousands of other communities like Petoskey, in all parts of the world, Superior and Atlas Diesels are constantly solving power problems. The facts and figures on these Superior and Atlas Engines reveal the full story of proven power. For complete details on how Superior and Atlas power can work for you, contact any one of the Engine Division offices listed below, or write Springfield, Ohio.

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ATLAS Imperial DIESEL ENGINES
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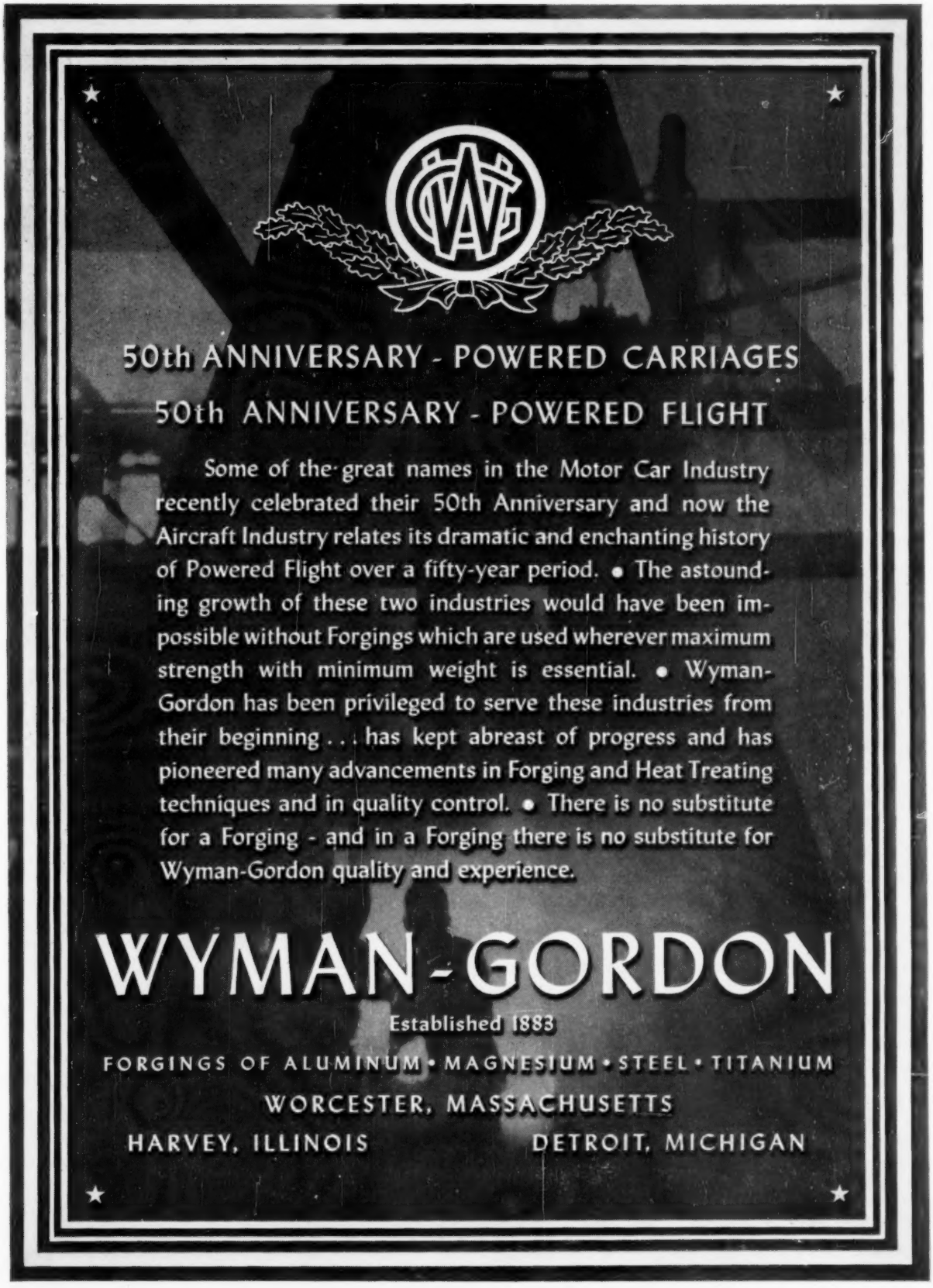
Distributor of Lister *Diesels in the U.S.A.*


50th ANNIVERSARY - POWERED CARRIAGES
50th ANNIVERSARY - POWERED FLIGHT
Some of the great names in the Motor Car Industry recently celebrated their 50th Anniversary and now the Aircraft Industry relates its dramatic and enchanting history of Powered Flight over a fifty-year period. • The astounding growth of these two industries would have been impossible without Forgings which are used wherever maximum strength with minimum weight is essential. • Wyman-Gordon has been privileged to serve these industries from their beginning . . . has kept abreast of progress and has pioneered many advancements in Forging and Heat Treating techniques and in quality control. • There is no substitute for a Forging - and in a Forging there is no substitute for Wyman-Gordon quality and experience.
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FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM
WORCESTER, MASSACHUSETTS
HARVEY, ILLINOIS
DETROIT, MICHIGAN

The Engineer's Report

CASE HISTORY

PRODUCT Chevron Starting Fluid

FIRM Young Truck Lines, Salt Lake City, Utah

Starting fluid saves 1152 man-hours per winter!

A LITTLE CHEVRON STARTING FLUID, injected into the intake on the diesel engine of this truck, starts it instantly in temperatures far below zero. The fast starts eliminate delays that amounted to at least 16 hours per week on each of 6 trucks like this operated by Harry L. Young and Sons, Inc., Salt Lake City. Used for hauling mining machinery in the mountain states, these trucks often must be parked outside over night where it is extremely cold. Chevron Starting Fluid starts them anywhere they go without the aid of booster batteries. It is available in 1-pint cans, and in 7- and 17-cc capsules. In 9.9-cc pressure primer steel bulbs, ask for Chevron Priming Fuel. Your fluid supplier also has special primer equipment.

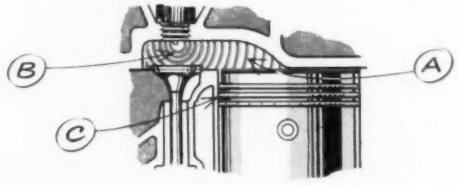
FREE FOLDER tells you more about Chevron Starting Fluid and where to apply it on different engines. Write or ask for it today.

FOR MORE INFORMATION about petroleum products of any kind or the name of your distributor, write or call any of the companies listed below.

CHEVRON STARTING FLUID

TRADEMARK REG. U.S. PAT. OFF.

How CHEVRON Starting Fluid Starts Gasoline and Diesel Engines Instantly



A. Atomizes in lowest temperatures and provides easily ignited vapor in combustion chamber.

B. Pressure, or the weakest spark, fires mixture—turns engine and heats air for regular fuel mixture.

C. Contains lubricant and additives—inhibits cylinder wear and ice formation in primer equipment.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

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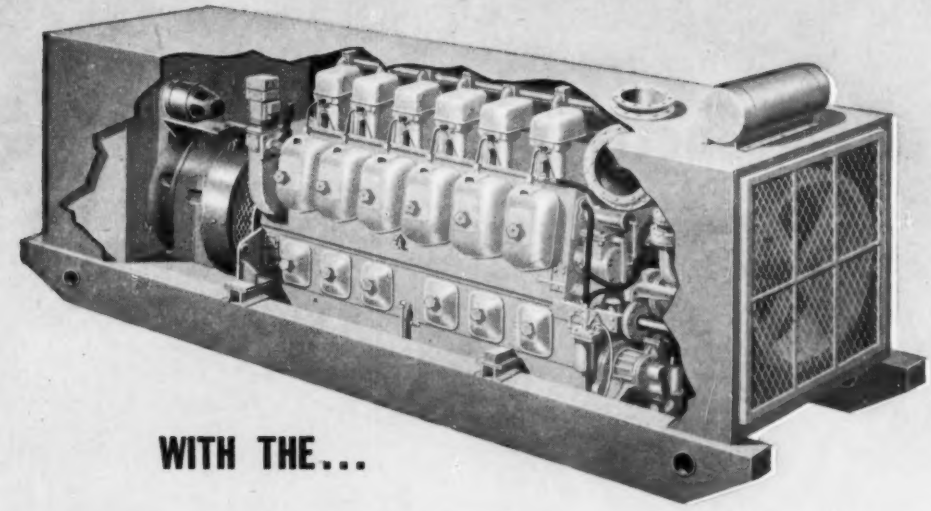
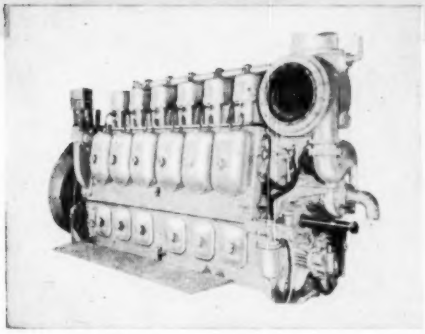


WITH THE...

NEW, PORTABLE ALCO DIESEL ELECTRIC GENERATOR UNIT



Alco 6-cylinder, 9″ x 10½″ (251-A), 4-cycle, turbocharged diesel engine, dry weight 21,350 lbs. Twelve- and 16-cylinder engines also available.

for

- ★ Emergency power generation
- ★ Power during construction or repair
- ★ Supplemental power during peak periods
- ★ Hospital or civil defense standby service
- ★ Scores of other municipal and industrial uses

Here's the answer to your demand for a compact, economical power generating unit for emergency, temporary or standby service.

A completely self-sufficient power plant, the new, portable Alco Diesel Electric Generator unit consists of a 9″ x 10½″, 4-cycle turbocharged Alco diesel engine, in sizes ranging from 390 to 1300 kw, with all necessary auxiliary equipment.

It can be rail-mounted for electric power *where* you want it, *when* you want it. It can be installed permanently for applications such as standby service in hospitals and municipal power plants.

Either way, it puts dependable power at your immediate call twenty-four hours a day.

Let us tell you more about this versatile new unit in terms of your own operations. Write or phone your nearest Alco sales representative today for complete information. Offices in New York, Beaumont, Chicago, Cleveland, Houston, Kansas City, San Francisco, Schenectady and St. Louis.

ALCO DIESELS

AMERICAN LOCOMOTIVE COMPANY
SCHENECTADY, N. Y.

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THE main press cylinder here illustrated is a part of a huge extrusion press for the Air Force. Some of these presses are rated at 50,000 tons. This forging was produced from ingot to finished job here at Erie Forge & Steel Corporation. Extremely close tolerances were required on the finished part with particular attention being paid to the polished finish on the interior walls. Expert craftsmen performed every operation here in our plant . . . one control, one responsibility. We are specialists in producing steel forgings—all shapes and sizes. Consult with Erie Forge on your next forging requirements.

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KWIK-WAY Cylinder Boring Machines are simple in set up and operation. They're precision engineered for maximum accuracy—real time-savers on all types of boring jobs.

Call in your KWIK-WAY man for a demonstration . . .

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- **Three finger centering**
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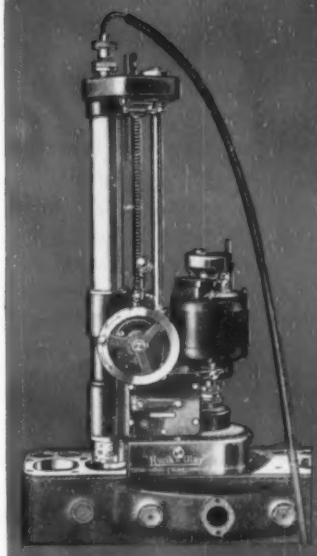
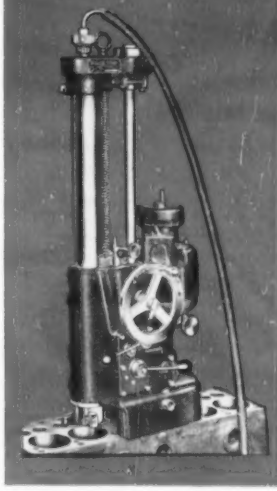
- **V-belt spindle drive eliminates evidence of gear chatter on finished cylinder wall**
- **Pre-loaded spindle bearings**
- **Quick, easy, accurate tool setting eliminates "sense-of-feel"**



Model "FT"
Capacity
2.630" to 5 9/32",
12½" stroke



Model "FR"
Capacity
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KWIK-WAY precision equipment is sold only through factory trained representatives. Mail the coupon below for appointment or complete information.

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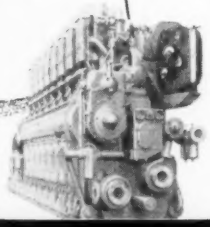
Check these points on Enterprise Diesel Service

- Service offices and parts warehouses strategically located for fast round-the-world service.
- Prompt processing and factory delivery on parts not normally stocked in local warehouses.
- Quick handling of all routine or emergency overhaul work.
- Expert supervision of any engine service constantly available by experienced ENTERPRISE Service Engineers.

ADD IT ALL UP and it pays to buy ENTERPRISE—backed by ENTERPRISE Specialized Service.



Enterprise customers get fast service and parts within hours

Wherever you are, ENTERPRISE service for marine and stationary diesel engines is just as near as your phone.

Usually within a few hours critical parts or service will reach you any place in the world from strategically located ENTERPRISE warehouses.

Whatever your requirements, whether for a simple replacement part or for complete specifications on a new diesel power plant, get in touch with your ENTERPRISE service office. You will find the people there friendly, competent and prompt.

Call the local office near you, telephone the San Francisco factory, or cable ENTERFOUND. Your needs will be immediately routed to the service point nearest you.

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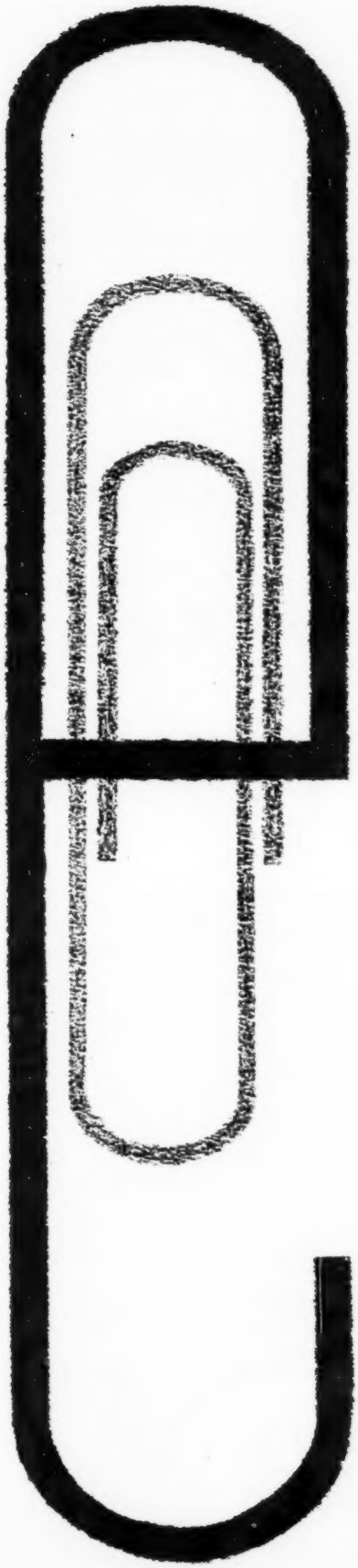
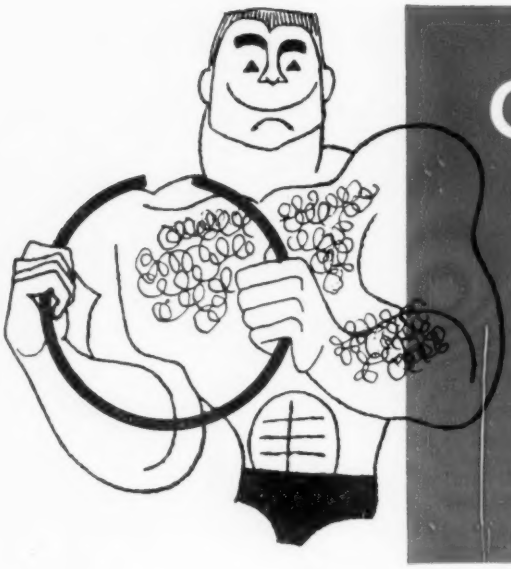


On Working Willing Horses . . .

A small municipal utility recently issued bid specifications for additional generating capacity. The six-page document prepared by the plant superintendent was a composite of various data obtained from sales representatives. It brought more questions than bids. No one built such an engine and every bidder had to take exceptions. This is no isolated case. Wise in the intricacies of plant operation, superintendents may lack design savvy—and, anyway, is it his job? Operational duties will more than fill his time and if he takes out time for design work and specification writing, plant operation will suffer. He cannot and should not be expected to wear two hats at the same time. Obtaining experienced consulting engineering services is both necessary and wise. A poorly engineered improvement program

ditorially speaking

can lead to costly errors. Take the case where a new fuel supply system was installed only to find that while it worked well with one engine on the line, the second engine, when started, robbed the first's fuel supply so that it wouldn't carry its load. Then, there was the new cooling system wherein water loaded with bicarbonates and chlorides teamed up with a poorly designed closed system to cause a perpetual headache. Or the plant with several gas-diesels and only a single gas meter on the common supply so that it was impossible to determine fuel economy of any one unit. No, operation is one thing; design another. To expect both jobs from the same person at the same time—no matter how willing or competent—is another case of "working willing horses . . ." The assistance of experienced consultants is desirable for improvement programs and can be helpful with troublesome operating problems as well.



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No other piston ring material combines so many advantages as

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- Cyclan is Sealed Power's new alloy for extreme operating conditions.
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- Cyclan retains the bearing characteristics of cast iron.
- Cyclan has extra high impact value for resisting shock.
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- Cyclan piston rings are especially durable in super-charged engines.
- Cyclan can be readily chrome-plated, but functions efficiently without plating.
- Cyclan is available for original equipment rings in heavy duty engines.
- Some Sealed Power Cyclan Ring Sets are available for replacement use now. Others will follow soon.

Let our engineers tell you the Cyclan story!

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Sealed Power

PISTON RINGS · PISTONS
CYLINDER SLEEVES

highlights

■ The proved reserves of crude oil in the United States have more than doubled in the last 15 years.

■ An exhibition of British-made cars and allied equipment will be held in Toronto as an integral part of the Canadian National Sportsman Show from March 12 to 20, 1954.

■ At last account, there were approximately 42 models of diesel-powered farm tractors being offered by about 14 American manufacturers. The use of diesel-powered farm tractors has been steadily increasing.

■ It was recently reported that the Daimler-Benz Corp. of Stuttgart has landed an order for 3000 Mercedes Model 170 SD diesels for use in taxicabs in Argentina. This followed a trial order for 500 diesel-powered Mercedes Taxis previously shipped to the Argentine.

■ As of November 1, 1953, Class I railroads has on order 603 diesel-electric locomotive units.

■ Detroit, Michigan will be host to the Lubrication Committee of the American Petroleum Institute from February 15 to 17, 1954. The place—Sheraton-Cadillac and Statler hotels.

■ According to AAR, Class I railroads got 7.6 per cent more mileage out of freight locomotives and 10.7 per cent more mileage out of passenger locomotives in the first six months of 1953 than they did in the same period of 1952.

■ Fairbanks, Morse & Co. has received an order from the Virginian Railway Company of Norfolk, Virginia for 25 diesel-electric locomotives, according to Robert H. Morse, Jr., president. The order is for 19 2400-hp Train Masters and six 1600-hp general purpose road switchers.

■ During the 12-month period ending September 30, 1953, Class I railroads placed in service 2313 diesel-electric locomotive units.

■ A revised outlook prepared by the Dept. of Commerce and Bureau of Labor Statistics estimates that expenditures for new construction during 1953 will exceed those of 1952 by about 6 per cent when totaled up.

■ The B&O sent its first train into the city of Washington over 118 years ago. Today, service out of Washington is 100 per cent dieselized as is service out of Baltimore and Philadelphia.

■ EMD recently passed the 25 million horsepower mark. For the statistically minded, according to EMD, 25,000,000 hp would pull a string of box cars more than 31,000 miles long at 10 mph over a level track.

■ Call 'em Turnpikes, Toll Roads or Thruways—many states are planning such roads and it takes diesel-powered equipment to build them.

■ Rumors are flying . . . It was recently reported by a supposedly reliable source that a diesel-powered sports car of British manufacture would be marketed in this country shortly. So far, it hasn't been confirmed!

■ Between 1945 and 1950, crawler tractor population on American farms increased approximately 70 per cent.

■ "Fifty Years on Tracks" will be the 1954 Caterpillar theme. This anniversary dates back to the successful testing of the first practical track-type tractor on Nov. 24, 1904 by the Holt Manufacturing Co., one of "Cat's" parent companies. It was the Holt Company which originated the trademark, "Caterpillar".

by Peter B. B. Andrews,
Supervising Economist Future Sales Rating

1954 Diesel Engine Prospects

For the third year, Dr. Andrews was commissioned to make a survey of what the diesel industry might expect in 1954. Here is the result.

Dr. Andrews has had a long and successful career as a marketing economist and statistician. In his capacity as supervising economist of Future Sales Rating, he directs the activities of 300 government and business experts. This board of analysts has been forecasting the sales prospects of principal American industries for 19 years in Sales Management with an outstanding batting average of over 85 per cent accuracy, a record maintained in last year's report to the diesel industry.

A MIXED outlook for potential diesel sales in 1954 is envisioned by the board of analysts of FUTURE SALES RATING. Thus of the nine major categories covered, the sales to three—Railroads, Highway Transportation, and Agriculture—are expected to be lower in 1954 than in 1953. The sales potentials of the remaining six categories are expected to be higher than for last year.

Overall, the picture is viewed as favorable for this great basic-growth industry. The board lays stress on the necessity of vigorous promotion and sales policies if the potential goal is to be achieved. Along with all industry, the diesel industry is facing a period characterized by the need for increasingly hard and aggressive sales efforts.

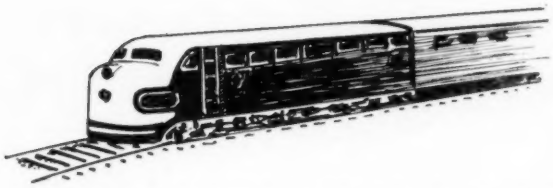
Given this prerequisite, the board anticipates that the nation's dollar expenditures for diesels could be historically among the best despite economic beliefs in some quarters that some general business easing may be in order for the year 1954. A foremost consideration in the board's optimistic appraisal of diesel sales potential is the basic efficiency intrinsic in the product itself.

Diesels offer an outstanding area for cost reduction by American business. With all costs rising, further improvement in power techniques continues to represent a fruitful source of savings.

With these consensus estimates of the board of analysts of FUTURE SALES RATING, it is only logical that the diesel engine industry has again been assigned a rating of five stars, the highest rating any industry can get, as its sales outlook for the year 1954.

Fundamentally, the financial position of the market is found strong, emphasizing the favorable buying power potential. Working capital of American corporations now is at an all-time high, approximating 90 billion dollars, with current assets well over twice current liabilities. Then too, institutions with large amounts of cash to invest, such as insurance companies, stand ready for financing as the Equitable Life Assurance Co. did in the instance of the B&O's acquisition of diesel locomotives.

Further thinking specific to each category will be included in the following discussions.



On railroads, the board considers the "proof of the pudding is in the eating"; the rapid rise of dieselization speaks for itself. The widespread acceptance of diesels has paid off handsomely in operating economies. To use an example, savings in locomotive operating expenses for the 100 per cent dieselized St. Louis, San Francisco (1951 compared to 1952), amounted to $1,367,860. This figures out to an annual saving of about $37,000 per diesel unit, a return on investment of better than 20 per cent.

Last year, dieselization saved the Class I railroads $604,063,000 in fuel and maintenance alone. Complete dieselization would have saved $249,168,000 more. Net operating income of the country's Class I railroads increased 14.5 per cent in 1952 despite an increase of only 1.8 per cent in total operating revenue and an overall decrease in revenue ton-miles.

In considering potential production and sales, the government's expansion goal cannot be overlooked. This was set at 15,500 units to be built between January 1, 1950 and July 1, 1954. It included all requirements for U.S. railroads, but excluded industrial locomotives, those for defense agencies, and locomotives for export.

Within this framework, there is still a substantial market for future production. At present, there are 45 Class I railroads performing 100 per cent of their gross ton-miles by diesel power; 25 use diesels for over 90 per cent and 8 use diesels for over 80 per cent. There are 18 roads that use diesels for from 50 to 80 per cent of their gross ton-mileage.

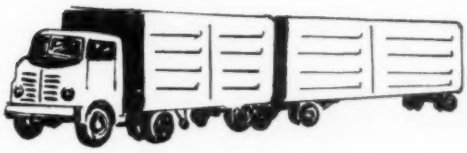
Railroads generally have achieved a good working capital and they should be able to make substantial additions to their equipment in 1954. Naturally as saturation of the railroad market increases, the potential market tends to shrink. Nevertheless, a considerable market still exists and the future holds a substantial replacement market. New units of improved design, rebuilding and re-engining to increase horsepower and update equipment, are all part of this potential business.

The board's consensus on diesel-electric units sales for 1954, along with 1953 estimates and yearly figures back for three years, are shown in the table.

RAILROADS

"Consensus of the board on diesel-electric unit sales potentials for 1954 show 2140 units."

Year	Total Units
1954	2140
1953	2625
1952	3076
1951	3629
1950	3370



Highway transportation has just completed a financially favorable year, stimulated in considerable measure by the economies of diesel engines. When all the figures are in, tonnage volume by overroad truckers is expected to wind up for the year 1953 about 10 per cent ahead of 1952, with expenses fairly well under control through the benefits of improved equipment.

The peak of yearly diesel truck sales occurred in 1952, somewhat later than in the case of diesel buses. A good percentage of the equipment is relatively new and the demand tapered off moderately as the result of earlier heavy buying. Many factors would indicate that the condition is temporary in nature. Replacement will be an increasingly important factor as trucks become older and as improved equipment renders some models uneconomic. Also, achievement of current moves toward a greater degree of uniformity of various controlling state regulations will afford an impetus.

Success of diesel buses points to a better year in 1954 than in 1953. The crest of the diesel bus sales curve occurred shortly after World War II and the replacement market is becoming stronger. Like for trucks, improved equipment promising greater efficiency is speeding replacement. New bus production, either as original equipment or for replacement, and engine replacements lead the board to forecast that more engines will be produced for this service in 1954 than in 1953. Estimates are shown in the accompanying table.

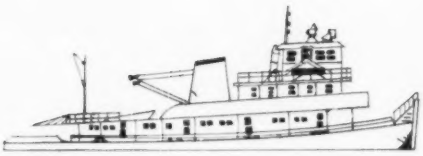
Other considerations confirm this viewpoint. Improved roadways will provide a stimulous for the entire highway transportation field. To bring them up to requirements, the enormous sum of 70 billion dollars worth of construction, improvements, and maintenance is estimated as necessary. Therefore, an increase in the spending rate to around 7 billion dollars, compared with the present $4,800,000,000 annual rate, is regarded necessary to catch up with requirements in the next 10 years.

With improved roadways, trucking will expand. Then, the expected increase in population, growing at a phenomenal rate, will contribute to both the need for moving more goods and also passengers.

HIGHWAY TRANSPORTATION

"The board estimates 12,180 diesel engines for trucks and 3350 diesel engines for buses as the sales potential for 1954."

Year	Truck	Bus	Total
1954	12,180	3350	15,530
1953	13,584	2806	16,390
1952	14,689	3157	17,837
1951	17,103	4662	21,765
1950	14,620	2409	17,029



The marine field is a virile one for diesel engines. Taking a single field of diesel application, in the years 1931-50 ton-miles shipped over inland waterways grew 460 per cent, with 510 per cent in Mississippi traffic alone. Larger tows are calling for more powerful towboats. In the Mississippi River System there are over 1635 towboats with over 880,000 hp. The 3200-hp, 3600-hp, and 4800-hp boats are becoming more common now.

River and harbor projects, flood control work, etc., require more dredges, derrick boats, work boats, and special craft. Offshore oil well drilling is also taking more water craft, practically all of them diesel-powered. Greatest prospect for growth appears to be in the water-transportation field. Added to this is the replacement potential, not only by nature of age, but technological advancement.

The future is seen by the board as a healthy one embracing good demand potentials. This is indicated in the figures forecast in the accompanying table.

MARINE

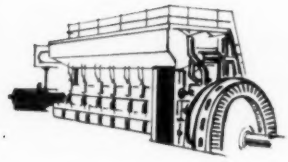
"A total of 128 vessels over 100 gross tons is visualized as the 1954 sales potential covering marine diesels. For smaller vessels, diesel engine sales potential for 1954 are estimated at 2225."

Year	Vessels Over 100 Gross Tons	Diesel Engines For Smaller Vessels
1954	128	2225
1953	131	2119
1952	114	1966
1951	81	2162
1950	77	1869

MUNICIPAL AND UTILITY

"Under the sharp population increases in many areas and a general increase in kilowatt consumption per capita, electrical power demands are up too. Gas and sanitary utilities will also use internal combustion engines."

Year	Installations
1954	425
1953	392
1952	355
1951	450
1950	436

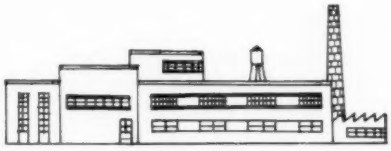


Under the stimulus of sharp population increases in many areas and a general increase in kilowatt consumption per capita, electrical power demands are up sharply too. Whether supplied by a municipal power plant or utility, expansion is necessary. In the case of the former, diesels are commonly the primary source of power.

The 1953 totals for expansion of new plant and equipment by public utilities aggregated about $4,430,000,000—a 15 per cent jump over the 1952 total. Some of this is used to purchase diesel engines for peaking, end-of-the-line, and standby service.

In addition to electrical power generation, municipalities use diesels, dual-fuel, and gas engines for other purposes. One of these is for pumping—gas pumping in connection with gas utilities, water pumping both for potable water and sanitary systems, and for drainage pumping. Dual-fuel engines are finding favor in sewage disposal plants.

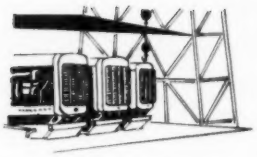
The estimated sales potential is shown in the accompanying figures for this category.



For generating power in general industrial applications, engines range in size from the large units found in the aluminum reduction plants to small emergency standby units. The board believes that much can be done to improve sales in this broad field by making clear the economic advantages of diesel power to such industries as textiles, which spent $296,000,000 in new plant and equipment last year; food and kindred products, which spent $516,000,000 in 1953; beverages, which spent $325,000,000; paper and allied products, which spent $406,000,000; chemicals, which spent $1,800,000,000; petroleum and coal products, which spent $2,825,000,000; rubber products, which spent $140,000,000; and fabricated metal products, which spent $577,000,000.

In many of these industries, recaptured waste heat in engine cooling water and exhaust could be used to advantage in the processing involved. The overall efficiencies should prove very attractive.

The board estimates that, contingent upon more and ingenious application studies, a greater number of engines can be sold in 1954 than were sold in 1953. Figures are shown in the table.



The petroleum industry, for obvious reasons, does not need quite as much selling on the diesel's desirable qualities as do some other industries. It is a field which has made, and continues to make, large expenditures for new plant and equipment. The great rise in vehicle registrations with prospects of still further growth and the generally increased use of all hydro-carbon products compells a growth pattern. Worldwide tensions have made necessary additional development of petroleum sources and refining capacity, here and in Canada. Reflecting this, the government expansion goals for this industry have approximated two billion dollars.

Practically every phase of the petroleum industry uses diesel or gas engines. Many of the engines will be reported in other categories, for example, the many diesel-powered trucks used will be under "Highway Transportation" and tanker engines under "Marine". The forecast figures in the accompanying table refer to direct use, including pipeline pumping engines.

PETROLEUM

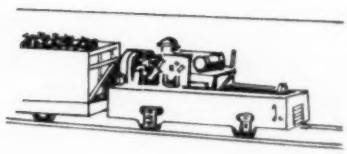
"Practically every phase of the petroleum industry uses diesel or gas engines. Increased use of hydro-carbon products, coupled with worldwide tensions making necessary development of additional sources, compel a growth pattern."

Year	Engines
1954	4400
1953	4280
1952	4164
1951	3903
1950	3546

GENERAL INDUSTRY

"Contingent upon more and ingenious application studies, a greater number of engines can be sold in 1954 than in 1950."

Year	Engines
1954	11,200
1953	10,780
1952	12,987
1951	13,146
1950	12,378



The mining industry is expected to use more diesels in 1954 than in 1953, as can be seen in the accompanying table. Expanded open-cut and strip mining will require more diesel-powered equipment and further use of such equipment is expected in underground mines.

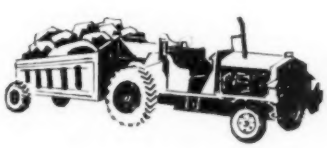
In 1953, the mining industry spent a total of $892,000,000 for new plant and equipment, compared with $880,000,000 in 1952. American mining interests are engaged in a program involving expenditure of two billion dollars. Canadian private interests plan to spend $1,600,000,000 for new mining plant and equipment in the 4-year period 1951-1955.

The isolated nature of most mining operations makes diesels particularly suitable. The industry is a growing user of them for mobile equipment including trucks, tractors, bulldozers, mine locomotives, shovels, etc., and stationary engines for supplying electrical power, powering hoists, crushers, and special equipment.

MINING

"Mining industry demand for diesel engines in 1954 is expected to be higher than in 1953. Reflecting the substantial nature of this market, the board estimates a 1954 sales potential of 3150."

Year	Engines
1954	3150
1953	2635
1952	1950
1951	2325
1950	2317



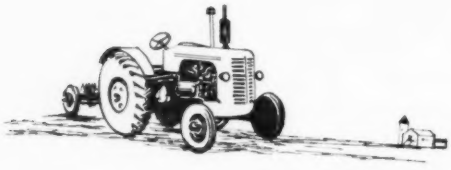
Both the expanding economy and population are a basic index of construction needs; it is tremendous. Construction of all types of buildings, including residential and commercial, is progressing at a high rate. The backlog of public works was never greater. Mounting costs postponed many post-war public works and the Korean war terminated all but essential building. The estimated backlog is set at 130 billion dollars. And some building construction such as schools cannot be delayed.

Among the Federal projects are flood control and river and harbor work totaling $4,900,000,000; reclamation at $1,192,000,000; Tennessee Valley development at

$1,320,000,000; AEC projects at $2,400,000,000; and other projects at $1,588,000,000. These programs are fully planned and represent only part of the potential. On all of this work, diesels or diesel-powered equipment is essential.

Highway construction and improvement is a pressing need all over the country. Details are given under "Highway Transportation".

Reflecting the great underlying construction needs and the importance of the diesels in this field, an increased sales potential is forecast for 1954.



Agriculture is one of the temporary weaker elements in the diesel picture. The sharp drop in farm prices in 1953 and the unfavorable parity spread to the farmers are reasons. The industry is still one of the largest potential markets however, and with its inevitable revival will bring with it a substantial demand for diesels in farm machinery.

Although the decline in sales to agriculture has centered primarily in tractors and related equipment, there is an increasing demand for diesels in irrigation pumping. While in competition with many other forms of power, diesels are becoming more popular where pumping operations involve 600 or more hours a year, since this is the breakpoint beyond which sizable economies can be effected.

CONSTRUCTION

"Reflecting the great underlying construction needs and the importance of diesels in this field, the board estimates that there are sales potentials in this field for 1954 approximating 26,200 diesel engines."

Year	Engines
1954	26,200
1953	25,400
1952	25,286
1951	28,583
1950	27,468

AGRICULTURE

"This industry is one of the temporarily weaker elements in the diesel picture. Sales potentials for 1954 for diesels to agriculture are estimated at 54,300 engines."

Year	Engines
1954	54,300
1953	58,158
1952	68,327
1951	70,000
1950	70,063

Conclusions

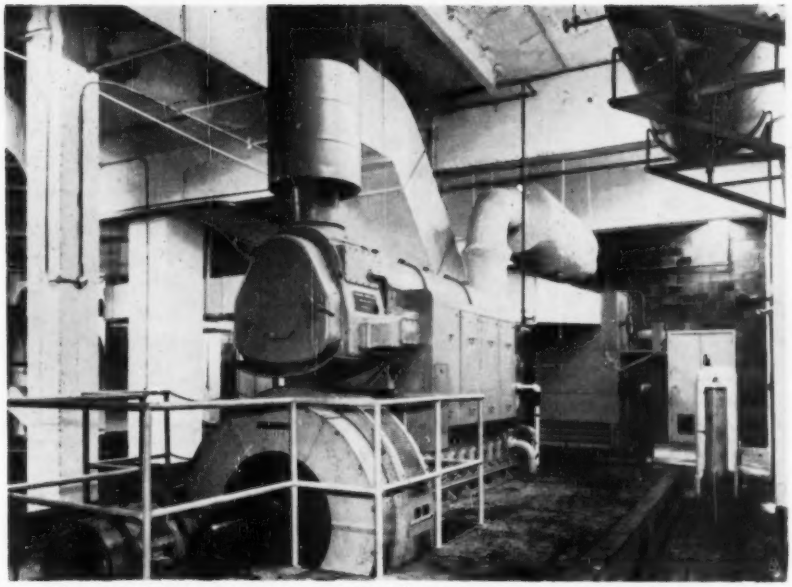
Although the total number of engine sales for 1954 is seen as being somewhat below that for 1953, the board of analysts foresees a good year ahead for the diesel industry. So good, in fact, that they have awarded it a rating of five stars, the highest possible.

This volume of sales is considered probable with the stipulation that the industry realizes the necessity for intensified promotional sales efforts. These must be applied not only to the current fields of diesel usage, but exploration and ingenuity must be used to develop new markets.

FIVE YEAR TOTALS

	1954 Projected	1953 Revised	1952	1951	1950
Railroads	2,140	2,625	3,076	3,629	3,370
Highway Transportation	15,530	16,390	17,837	21,765	17,029
Marine	2,225	2,119	2,080	2,243	1,946
Municipal	425	392	355	450	436
General Industry	11,200	10,780	12,987	13,146	12,378
Petroleum	4,400	4,280	4,164	3,903	3,546
Mining	3,150	2,635	1,950	2,325	2,317
Construction	26,200	25,400	25,286	28,583	27,468
Agriculture	54,300	58,158	68,327	70,000	70,063
	119,570	122,779	136,062	146,044	138,553

Note: Figures are estimated sales of all sizes and types of diesels, dual-fuel and gas burning engines.



Adequate space has been left in the hotel's engine room for the installation of an identical F-M unit, should the management find 100 per cent coverage necessary.

LUXURY WITH FORESIGHT

South America's newest luxury hotel is equipped with emergency stand-by power.

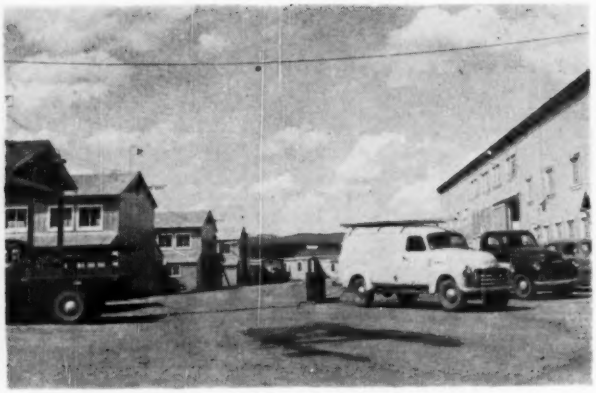
LUXURY in accommodations and service characterizes the newly opened Hotel Tequendama in Bogota, Columbia, S.A. And since even the best in equipment and service needs unfailing light and power, there is provision for emergency electrical power. This safeguard against power failure is a Model 38 Fairbanks-Morse opposed-piston diesel rated at 1040 hp, 700 kw, 875 kvw (80 per cent pf), at Bogota's 8700-ft altitude. The diesel drives a 700-kw, 3-phase, 60-cycle, 460-v, F-M generator.

The 16-story Hotel Tequendama was built with particular thought for tourists and visiting business men. Located in Bogota's best business and residential section, set off from its surroundings by a small park, the hotel has a total of 336 rooms with an estimated capacity of 650 guests. It is modern both in architecture and fittings. All rooms have central heating and all public rooms—the lobbies, dining rooms, grand ball room, convention halls—are air conditioned. There are Magic Eye doors, and in addition, the newest in elevators and burglar and fire alarm systems.

All these construction features for the comfort, convenience, and safety of its guests made provision of a source of emergency power imperative. F-M's diesel is capable of providing about 60 per cent of the total power and lighting requirements of the Hotel Tequendama. Provision was made to permit installation of another identical engine in the sub-basement power room, however, should the management find 100 per cent coverage necessary. The 1040-hp unit now installed is mounted on a special isolation base and inertia block which deadens all vibration.

The hotel, designed by Holabird & Root & Burgee of Chicago, Illinois in collaboration with Cuellar, Serrano, Gomez & Cia. Ltd. of Bogota, was built by Intercontinental Hotels Corp., a wholly owned subsidiary of Pan American World Airways and assisted by a $4 million loan from the Export & Import Bank in Washington, D.C. It is being operated by Intercontinental Hotels Corp. for the owners, San Diego Hotel Co., a Colombian company.

Bovill, Idaho, a community situated at the edge of the forest in a mountain meadow, at which the complete logging equipment maintenance center is located.



Main drag through the PFI Maintenance center at Bovill. Buildings from left are: two for parts department; engine shop; welding shop; and main shop at right.

PFI's Bovill Maintenance Center

Near-complete dependence of modern logging operations on diesel-powered equipment is well illustrated at the Bovill, Idaho maintenance shops of Potlatch Forests, Inc.

By Robert H. Forbes

PFI's Bovill division embraces approximately half of the company's logging operations which include the construction of haul roads and the transporting of logs to the railhead. Such an operation requires a long list of equipment with adequate maintenance facilities to back it up.

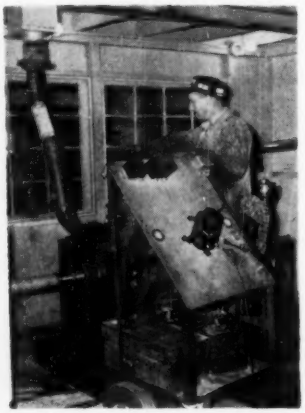
Equipment maintenance at Bovill centers around a large 32-ft by 130-ft building for primary repairs. Half the shop is devoted to the maintenance of logging trucks, while the other half maintains tractors, loaders and other diesel-powered equipment.

To complete the maintenance center, a number of smaller shops are grouped around the main shop. Two buildings house the parts department. Another building contains the well equipped electrical shop which handles ignition and starting equipment. Also housed in this building are the carburetor shop and battery shop. Power for battery charging is taken from a transmission line of a local power company. Usually the battery shop handles from 12 to 15 batteries all the time.

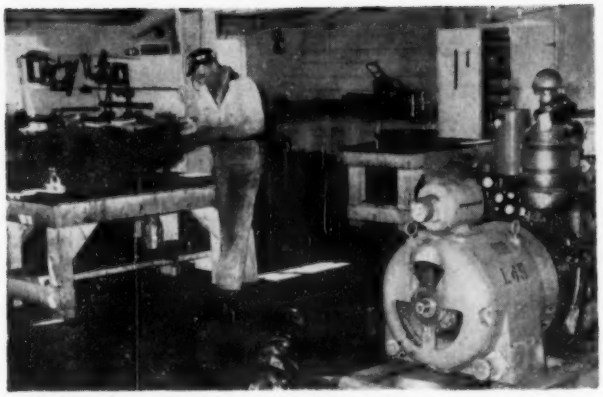
In still another building is the welding shop which has among its equipment three Lincoln welding machines, an automatic welding device for building up worn tractor rolls, an Oxweld auto-cutting machine, and a Rogers track press. Also housed in the maintenance center are a transmission and differential shop, carpenter shop, blacksmith shop, paint shop, and the all-important engine rebuilding shop.

In the tractor end of the main shop D-8 track assemblies are being reworked. A complete machine shop is also housed in this building.

Rebuilt engines are checked and run-in on a dynamometer (not shown) in engine shop before being reinstalled on vehicles or other equipment.



Here, Mr. D. C. Nelson, in charge of the electrical shop checks a starting motor for current draw, voltage drop, & torque on Weidenhoff test bench.



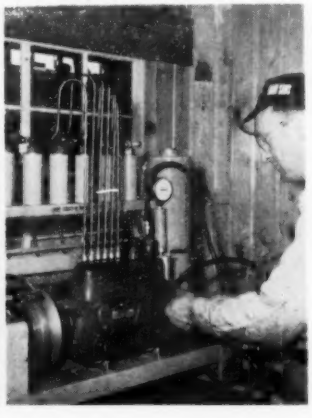
Harry Leno, in charge of the engine shop checks ring gap on an international TD-18A engine. At right is an International 20-TB light plant.

In addition to the maintenance center, each logging camp is furnished with a fairly complete maintenance department housed in a movable building, some of which are large enough to accommodate four logging tractors at once. Where a major overhaul is necessary, camp maintenance units return the equipment to the shops at Bovill. On the other hand, if trouble develops in a component assembly such as a fuel injection pump or starting motor, a replacement unit is installed and the replaced unit returned to Bovill for reconditioning.

Equipment at the outlying maintenance shops consists primarily of an engine generator set, acetylene and arc welding equipment, as well as grinders and mechanic's hand tools. Smaller maintenance shops are also located at the landings where logs are assembled to start their trip to the mill. Should a breakdown occur in the forest, it is taken care of by a trouble-shooter truck.

To effectively maintain its logging equipment, PFI employs between 15 and 30 maintenance men the year around, depending on whether logging operations continue through the winter.

In the injection equipment testing room are a Bacharach universal nozzle tester (Left) and an International fuel pump calibrating stand (Right.)



Form # W-31
POTLATCH FORESTS, INC.
SHOP RECORD
Date _____, 19__

Mfgr. _____ Model _____ P. F. Inc. No. _____ Shop Order No. _____

NOTICE Indicate all work done, especially important changes and sizes of parts used. This information should be listed each day by mechanic—checked by foreman.

ENGINE—
Entire Engine Changed ☐ New Engine ☐ Old Engine # _____ ☐ New Engine # _____
Engine Change slip turned in by _____
BLOCK—New ☐ Rebore ☐ Taper _____ Bore _____
SLEEVES—New ☐ Rebore ☐ Taper _____ Bore _____
HEAD—New ☐ Cold Welded ☐ Hot Weld ☐ Other _____
PISTON—New C. I. ☐ New Alum. ☐ Size _____ RINGS—New ☐ Size _____
VALVES—New Exh. All ☐ or #[1]-[2]-[3]-[4]-[5]-[6]-[7]-[8]
New Intake All ☐ or #[1]-[2]-[3]-[4]-[5]-[6]-[7]-[8]"
Regrind ☐ New Inserts ☐ New Guides ☐ Rocker Arm Bushings ☐
Other: _____
CRANKSHAFT—New ☐ Reground ☐ Metalized ☐ Main Dia. _____ Rod Dia. _____
Other _____
MAIN BEARINGS—New ☐ or New on' #[1]-[2]-[3]-[4]-[5]-[6]-[7] Size _____
CONNECTING ROD BEARINGS—New on #[1]-[2]-[3]-[4]-[5]-[6] Size _____
CONNECTING RODS—New on #[1]-[2]-[3]-[4]-[5]-[6] Wrist Pins New ☐ Bush. New ☐
TIMING GEARS— New ☐ OIL PUMP—New ☐ Overhauled ☐ Oil Pressure _____
Other Motor Work _____

ELECTRICAL SYSTEM—(Gasoline or Diesel Equipment)
MAGNETO—New ☐ Overhauled ☐ New Points ☐ Other _____
BATTERY—New ☐ Used ☐ Rebuilt ☐ No. Cells _____ Size _____
GRAVITY READING—#1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____ 7 _____ 8 _____
9 _____ 10 _____ 11 _____ 12 _____ 13 _____ 14 _____ 15 _____
BATTERY CABLES—New ☐ New Lugs ☐ Other _____
GENERATOR—New ☐ Rebuilt ☐ Overhauled ☐ New Brushes ☐ Other _____
STARTER—New ☐ Rebuilt ☐ Overhauled ☐ New Brushes ☐ Other _____
VOLTAGE REGULATOR—New ☐ Adjusted ☐ Rebuilt ☐ Other _____
STARTING SWITCHES—New ☐ Rebuilt ☐ Overhauled ☐ New Brushes ☐
STARTER—New ☐ Rebuilt ☐ New Brushes ☐ Other _____
SWITCHES _____
DISTRIBUTOR—New Points ☐ New Condenser ☐ Checked ☐ Other Work _____
COIL—New ☐ Tested ☐ Other _____
SPARK PLUGS—New [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12]
Cleaned and Tested ☐ New Wires ☐ Other _____
LIGHTS—Checked and Working ☐ Headlights RH ☐ LH ☐ Tail Lights ☐
Stop Light ☐ Clearance Lights, Number Red _____ Yellow _____
Other Lighting
SPECIAL SWITCHES—(Indicate numbers, type, and work done on each) _____
WIRING—New Throughout ☐ Repaired ☐ Other _____
Other Electrical Work _____

FUEL SYSTEM—(Gasoline or Diesel) (Indicate Work Done)
TANK _____ Gauge _____
GASOLINE FUEL PUMP—New ☐ Checked ☐ Overhauled ☐ Disch. Pressure _____
FUEL LINES & CONNECTIONS _____
CARBURETOR—New ☐ Overhauled ☐ Other _____
AIR CLEANER—Oil Changed ☐ Other _____

(OVER)

Front (above) and back (below) of shop record forms.

DIESEL FUEL PUMP—Overhauled ☐ Checked ☐ INJECTORS—Reconditioned ☐ Checked ☐
GOVERNOR—Repaired ☐ Maximum Engine Speed _____
Other Work _____

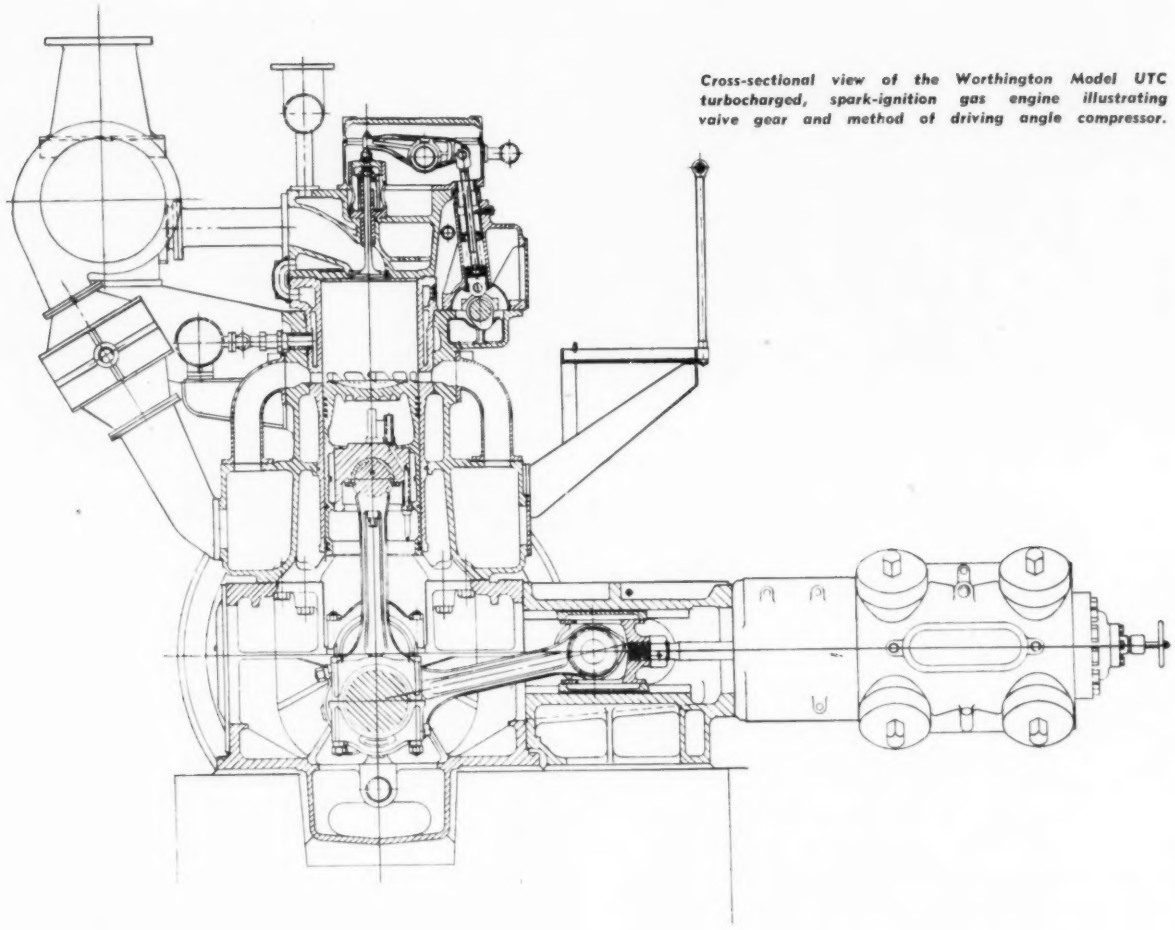
COOLING SYSTEM—
WATER PUMP _____
HOSES (Name Those Replaced) _____
FAN _____ FAN BELT—New ☐ Size and Number _____
RADIATOR—New Core ☐ Repaired Core ☐ Other _____
THERMOSTAT—New ☐ Checked ☐ SHUTTERS Repaired ☐ Checked ☐
TEMPERATURE INDICATOR—New ☐ Checked ☐ Other _____
ANTI-FREEZE—Kind _____ Amount Added _____ Temp. Test _____ °F

TRUCKS—(Check indicates the unit has been put in good working order.) (Write in principal work done.)
CLUTCH ☐ MAIN TRANSMISSION ☐ AUXILIARY TRANSMISSION ☐
UNIVERSAL JOINTS ☐ FRONT AXLE ☐ FIRST REAR AXLE ☐
SECOND REAR AXLE ☐ DRIVE SHAFTS ☐ STEERING GEAR ☐
BRAKES LINED RF ☐ LF ☐ RR ☐ LR ☐ R. TAND ☐ L. TAND ☐ EMERG ☐
BRAKE SYSTEM ☐ SPRINGS, RF ☐ LF ☐ RR ☐ LR ☐ R. OVERL ☐ L. OVERL ☐
WHEEL BRGS. RF ☐ LF ☐ RR ☐ LR ☐ R. TAND ☐ L. TAND ☐
WHEELS & RIMS RF ☐ LF ☐ RR ☐ LR ☐ R. TAND ☐ L. TAND ☐
SPEEDOMETER ☐ TACHOMETER ☐ HEATERS ☐ WINDSHIELD WIPER ☐
FENDERS ☐ BUMPERS ☐ CAB ☐ GLASS ☐ DOORS ☐
Other Items and Notes _____

TRACTORS—(Check indicates the unit has been put in good working order.)
STARTING MOTOR ☐ CLUTCH ☐ TRANSMISSION ☐
BEVEL GEAR ☐ STEERING CLUTCH MECHANISM RH ☐ LH ☐
FINAL DRIVE UNIT, RH ☐ LH ☐ TRACK FRAME NEW RH ☐ LH ☐
SPROCKETS, NEW ☐ REBUILT ☐ ROLLS NEW ☐ REBUILT ☐
IDLERS, NEW ☐ REBUILT ☐ TRACK, NEW ☐ REBUILT ☐
Other Items and Notes _____

GENERAL NOTES—

(Make all other notes of importance on another sheet of paper and attach.)



Cross-sectional view of the Worthington Model UTC turbocharged, spark-ignition gas engine illustrating valve gear and method of driving angle compressor.

Fully Turbocharged 2-Cycle Gas Engine Compressor

AN experimental 2-cycle fully-turbocharged spark ignition gas engine compressor has been developed by the engineers of Worthington Corporation. This unit represents an advance in integrated engine design providing more powerful compressor service in a minimum of space, lower noise level in operation, and increased thermal efficiency.

The feature of self-sustained turbocharger operation at all loads will make the new units outstanding in their field for equipment simplicity, compactness, and reliability.

Worthington has for many years been a pioneer in research for the application of turbocharging to diesel oil and gas engines. As far back as 1940, this organization built and sold 4-cycle engines of this type. The success and acceptability of these units for industry is a matter of record.

While applying turbocharging to the 4-cycle diesel and gas engine through the years, Buffalo Works engineers have maintained a program of study for the application of turbocharging to the 2-cycle gas engine. Although new in application, the turbocharging principle used is the same as used on the 4-cycle engines for the past 13 years. The success of this program was demonstrated at the Buffalo Works on October 13, 1953 to O. H. Moore, research engineer and C. H. Stevenson, Hamburg, N. Y., Station superintendent, both of the Tennessee Gas Transmission Company. A 2-cycle turbocharged

spark-ignition gas engine was started, operated at no load, and at intermediate steps to full load, without external aid to the turbocharger.

Worthington's poppet-valve and uniflow scavenged UTC engine design expedited this development. By using energy of the pulsating exhaust gas flow and heat, turbocharger speed is sustained in step with the load applied. Other supercharging applications for 2-cycle gas engines have involved the use of a mechanical drive for direct power to the supercharger up to appreciable load. In such design, it is only at this appreciable load that the turbocharger can receive sufficient energy from the exhaust to be self-sustaining.

Referring to the engine diagram, we can see that air enters the cylinder through ports near the bottom, is compressed, and then released through exhaust poppet-valves in the head. This is the through-scavenging principle. The exhaust from each cylinder enters the turbocharger without interference so that it is possible to take full advantage of the pulse energy for turbocharger operation. An aftercooler, located at the outlet of the turbocharger, provides improved operation from the standpoint of load and thermal conditions.

Immediate advantages to the user become apparent. They include:

Savings—Tests indicate that impressive savings in installed horsepower costs for the user will be inherently available with this engine design.

Quieter Operation—With the turbocharged engine demonstrated at Buffalo on October 13, the exhaust gas flow is used directly for driving the turbocharger. Actual operation shows that the steadier flow of exhaust gases from the turbocharger contributes to a considerable reduction in general noise level. It might almost be said that the noise, previously a waste product, is actually put to work in the new engine.

Less Cooling Load—The exhaust gases are fed directly to the turbocharger without cooling, thus conserving usable energy. The gases are discharged from the turbocharger to a final exhaust without cooling. This results in reduced heat rejection to the cooling water.

It is a considerable compliment to the engineers of Worthington to note that no completely new engine design was required to produce the turbocharged unit. Having used the uniflow principle, the in-line engine, the poppet exhaust valve system with adjustable timing, balanced and rugged construction, and incorporation of those features which are necessary for simple economical maintenance, along with a compact and accessible construction, the new unit is more of a refinement than a radical change in design.

By utilizing the pulsating exhaust gas flow and heat, turbocharger speed is sustained in step with engine load. Intake air from the turbocharger passes through aftercooler before entering engine cylinder.

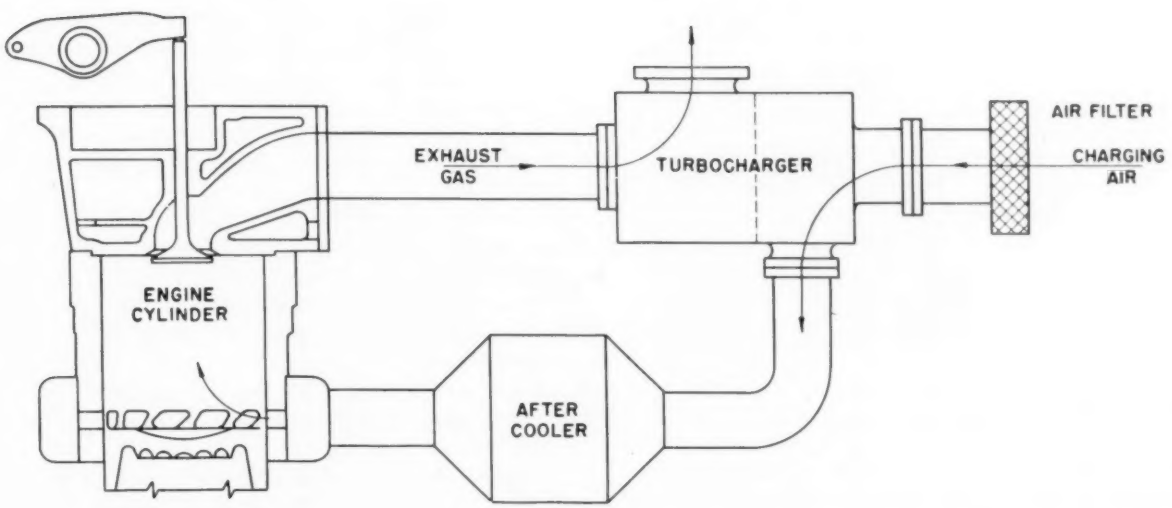
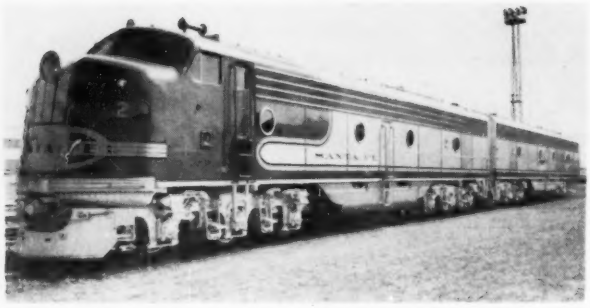


DIAGRAM OF WORTHINGTON UNIFLO TURBOCHARGING PRINCIPLE



Santa Fe's "No. 2" as it appeared after undergoing modernization at EMD's La Grange, Ill., plant. Formerly built as an 1800-hp locomotive in 1937, it has been converted to a modified E-8 GM locomotive with a horsepower rating of 2000.

EMD'S Rebuilding Program

A RECENT visitor to the new locomotive rebuild bay at the LaGrange, Ill., plant of GM's Electro-Motive Division, walked around one of the torn down locomotive units, paused reflectively, and then exclaimed:

"Where are the parts!"

He had expected to see a locomotive disassembled with the major components strewn about nearby—a logical assumption of virtually every visitor to Electro-Motive's rebuild facilities.

But to Electro-Motive men, that assumption is wholly illogical. It is illogical, they say, because it overlooks the most important principle in the economical rebuilding of such a complex product—utilization of mass production techniques and facilities.

Take the Santa Fe's old "Two Spot"—the famous "Number Two" built in June, 1937, to power the Santa Fe's well known Super Chief between Chicago and Los Angeles. It came back to Electro-Motive in the past year for what Electro-Motive men call "modernization."

The old "Number Two" was disassembled—salvable parts were re-used, such as the trucks, the D-27 traction motors which had been recently replaced, the main generators, and such smaller components as radiator sections and load regulators.

But we're getting ahead of the story. The locomotive, after being cleaned and torn down, literally was spread out all over Electro-Motive's 56-acre LaGrange plant. Electrical components went to the electrical rebuild department, where generators and motors of locomotive units to be rebuilt are disassembled, carefully inspected, and then rebuilt on the same regular production lines where new generators and new traction motors are manufactured.

The "Number Two," an E-1 model, or one of the first passenger units built by Electro-Motive, had its diesel engines replaced with brand new ones. But most rebuilt locomotive units have their old diesel engines rebuilt to new engine standards. Such engines go first to the engine rebuild department, where the engines are cleaned and torn down. All the parts are placed on skids and the skids labeled with the number designating the engine from which they were disassembled.

These engine parts are then sent to an inspection area where each part is inspected to rigid standards. Salvable parts go to the main engine assembly division where rebuilt engines go along the same assembly line as new engines and are rebuilt to the same standards, with all improvements in later production models incorporated into the rebuilt engine.

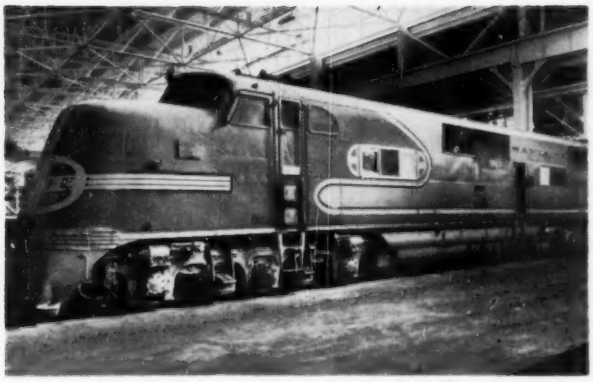
The rebuilt motors, generators, and diesel engines all receive the same manufacturer's warranty as new production models.

The old "Number Two" carbody was scrapped and a new E-8 (current passenger model) carbody with stainless steel panels was built to give protection and beauty to a locomotive that now was ready to take its place alongside brand new locomotive units—its original miles built back in, plus the additional mileage made possible by improvements built into the various components. About a dozen other early Santa Fe units are undergoing similar modernization.

A basic foundation for the locomotive modernization program at Electro-Motive is the long established company policy that every improved part for the locomotive must be designed to fit old equipment wherever possible. Each part made for a locomotive today must fit a locomotive of the same class built yesterday and make a better locomotive out of it.

Railroads are benefitting from EMD's modernization service in more ways than one. First, they get a completely modernized locomotive at a greatly reduced price. Second, they realize operating cost savings from modernized units that are comparable to costs of new locomotives. Since accident-damaged locomotives also are rebuilt as part of this program, railroads can salvage what otherwise might be complete losses by having damaged units brought back to top condition.

The economy of the modernization service, as stated earlier, is dependent upon mass production methods and facilities. Serving many railroad customers, Electro-Motive is able to spread fixed costs over a great many units, thus cutting the costs to the individual railroad. Meanwhile, latest engineering improvements are manufactured into the



Before and after pictures of early Santa Fe passenger locomotives, GM Model E-1, showing Unit No. 5 as it arrived at the La Grange, Ill. plant of EMD for modernization, and Unit No. 4 as it left La Grange as a latest production Model E-8 locomotive.

rebuilt locomotive—many improvements of which railroads themselves are not even aware.

Modernization, however, is just one phase of the rebuild services offered in this program. There are also the Unit Exchange and Rebuild and Return programs—both concerned with rebuilding of principal components.

To facilitate these two services, EMD has established a system of factory branches, so located that more than 90 per cent of GM locomotive units in service on United States railroads are "on line" to one or more of these branches.

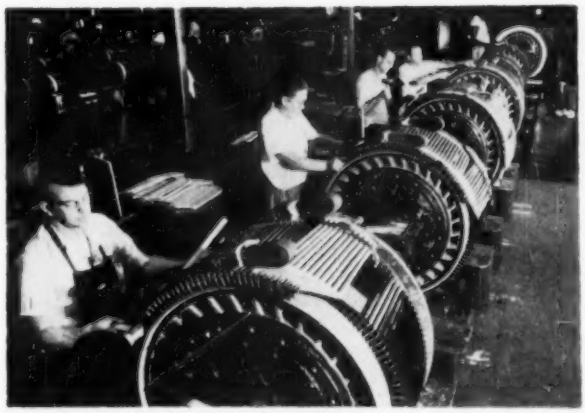
The Unit Exchange system, as its name implies, is designed to supply immediate delivery of re-manufactured components in exchange for worn assemblies. This saves the railroad costly delays in waiting for components to be rebuilt and enables them to reduce expensive inventories.

Under the Unit Exchange program, railroads scheduling maintenance in advance, order the required number of rebuilt components from factory branches. These rebuilt assemblies are delivered on regular schedules. When they are received on the railroad, the worn unit to be replaced is taken out and sent to the factory branch. This component is then rebuilt, utilizing mass production facilities, to standard quality and the railroad is only billed for the labor and new parts that had to be used to make the unit good as new. This component goes into the pool for delivery to a later customer.

If only minor rebuilding is required, the railroad gets full benefit for its program of preventive maintenance by receiving a low itemized bill.

Because all the latest engineering improvements are incorporated into every assembly re-manufactured by Electro-Motive, many Unit Exchange components often carry double the warranty these components had when they were new.

Sometimes railroads want an individual component rebuilt and returned. This service—Rebuild and Return—does just what it infers: takes the individual assembly, rebuilds it to the railroad's specifications, and returns it to the railroad, the railroad being billed for all needed parts and labor.



At La Grange, generators from old locomotives are torn down and sent through the regular production line where they are completely rebuilt.

Engines too—are handled in the same manner as the generators and other parts. They are torn down, cleaned, inspected and put through the regular production lines where they are rebuilt to present-day specifications.

But Unit Exchange and the locomotive modernization program offer the most economy to the railroads because under these services any improvements in current production models are incorporated into rebuilt components. That's because regular production lines, with the same skills, experience, and engineering standards that guide new production are utilized in rebuilding older components.

From all outward appearances, this modern 3500-kw diesel generating station at Acapulco, Mexico, would seem to be a permanent installation. The five GM engine-generator sets however, are skid-mounted and may be considered portable.

Diesels South of the Border

By W. J. Granberg

Diesels are playing an important role in the expansion of Mexico's electric generating facilities, bridging the gap which cannot be filled by hydro or steam power.

MEXICO, entering an era of industrial advancement, to say nothing of gains in agricultural and commercial endeavor, is engaged in an electrical power development program. This program is aimed at meeting the demands placed upon it by the nation's expanding economy. Diesel power is playing a vital part in the production of electrical energy throughout Mexico, for hydro-electric plants alone can never hope to fill the need from their limited potential.

Diesel generating plants built by private industry to provide power for specific needs are numerous, but it is the Comision Federal de Electricidad, the nation's public power agency, that is carrying out the elaborate construction program with the aim of ultimately sending power to every corner of Mexico. The CFE operates in much the same way as does the REA in this country, except that it is not confined to rural areas.

CFE power plants vary greatly in capacity and may be diesel, steam, hydro-electric, or a combination of any two of these. In some areas, the diesel installations were made with the thought that they might some day be run on natural gas piped in from nearby fields.

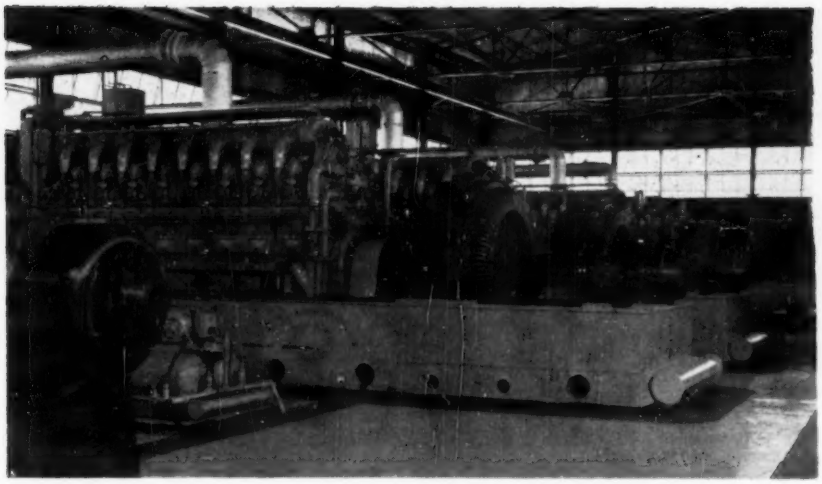
System Capacity

At the end of 1952, the CFE was operating 77 power plants in 24 states. These represented 196 generating units with a combined capacity of 387,846 kw. Diesel installations were as follows:

Fixed diesel plants	41
Generating units	110
Mobile diesel plants	6
Generating units	15
Diesel-steam plants	2
Generating units	8
Fixed and mobile diesel	3
Generating units	4
Mobile diesel-steam	3
Generating units	4

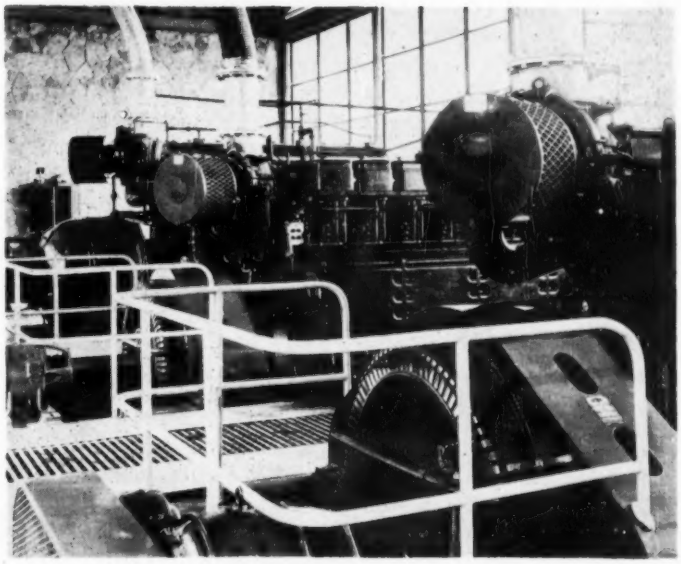
Thus of the 77 plants operated by the CFE, 41, or more than half, were entirely permanent diesel engine installations, while an additional 14 plants were either mobile diesel, a combination of the two, or steam augmented by diesel.

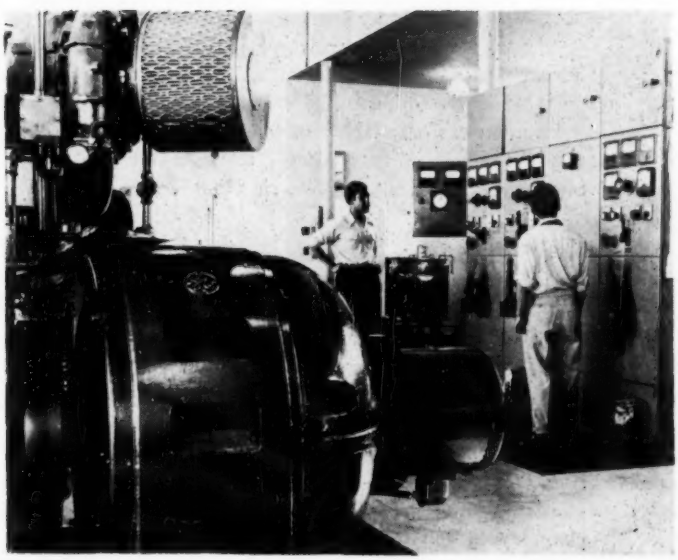
The 110 generating units in the fixed diesel plants have a combined capacity of 43,006 kw, while the 23 mobile units have an aggregate output of 19,400 kw. There are a total of 141 diesel units in service and their combined output is 74,282 kw; which means that more than one-



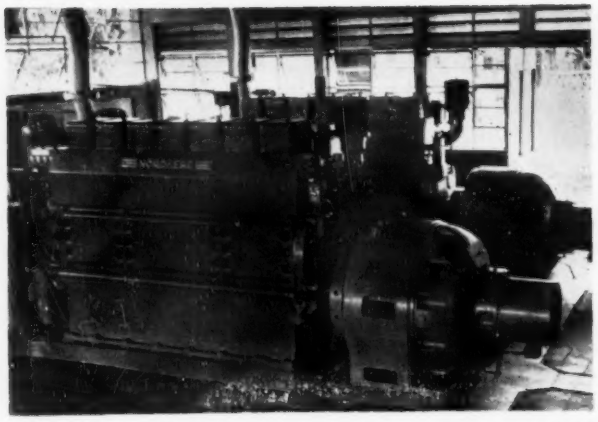
Because of the manner in which the five V-16 engines are mounted, the Acapulco generating station is classified as a "mobile" plant. Unit rating is 1600 hp at 750 rpm, or 1250 kva at 750 rpm. However, since the units generate 50-cycle current at 600 rpm, unit output is in the order of 700 kw.

An interior view of another of the CFE generating stations located at Tehucan, Mexico shows three Model FS-9 Nordberg turbocharged diesels direct-connected to generators. The two nearest units are 8-cyl engines with the one in the background being a 7-cyl model.





Total output of the Tehucan station is 1000 kw. This view shows the generator end and turbocharger of the 7-cyl Nordberg and the switchboard for the plant. As can be seen, the exciter for this unit is direct-connected while on the other two units, exciters are belt-driven.



At Cosamaloapan, Mexico power is generated by a pair of Model FS-97 normally aspirated Nordberg engines, providing a total output of 600 kw.

fifth of the power produced in CFE plants is provided by diesel-powered generators.

Actually it means more than that, for if it were not for diesel power, remote regions of Mexico would be without electricity. The relatively few large rivers are widely scattered and there are seemingly limitless desert regions where water is at a premium. If power produced by hydroelectric plants were to be available at all, it would have to be carried an impossible number of miles by transmission lines, something that both distances and mountain ranges preclude.

Mobile Units

The net result is that diesel power must be depended upon solely in many regions and partially in others. In some cases, the diesel engines and their generating units have been mounted on railroad cars for ease of mobility and installation. An example of this type of installation is the plant at Acapulco, a plush tourist resort on the Pacific Ocean, where five General Motors diesels drive generators producing a total of 5000 kw.

In all cases, the mobile installations were made with the idea in mind of moving the units to meet the power requirements of other areas in eevnt of emergency. The 23 mobile units in use have a combined capacity of 19,400 kw.

CFE Growth

Electric power in any appreciable volume was slow in coming to Mexico. Private industries and municipalities had their own limited installations, but it was not until the late 1930's when the CFE undertook its nationwide power plant construction program that things began to look up.

In 1939, the CFE plants produced 119,612 kw hr of power and the new installations that year had a rated capacity of only 405 kw. In 1947, new installations had a capacity of 28,575 kw, bringing the total to 72,899 kw, while the power output for the year totaled 283,309,967 kw hr.

In 1951 the total output was 745,429,142 kw hr. New installations in 1952 added 116,823 kw to the system to give the CFE network a total capacity of 389,808 kw. In round figures, the average annual power output by the CFE since 1947 has been 500,000,000 kw hr, an appreciable gain since 1939. As it stood at the end of 1952, the CFE system was producing approximately 800,000,000 kw hr a year.

Municipalities and private industry have made great strides in power plant installations since 1939. The total production of electric power in the 9-year period from 1939 to 1947 amounted to 18,216,188,000 kw hr throughout the nation, with the CFE producing only three per cent of the total.

In five years, 1947 to 1951, a total of 17,056,129,000 kw hr was produced, with the CFE producing 2,436,853,000 kw hr or 14.3 per cent. At the end of 1952 there were 12 new power plants under construction in eight states, calling for installation of 18 generating units. They will have a total capacity of 311,930 kw and when completed, they will bring the total installed capacity of CFE plants to 699,776 kw.

Of the plants under construction, three will be diesel-operated, calling for five diesel engines. These will have a rated output of 5230 kw. When the new projects are completed, the output of the CFE system will be almost doubled.

A Typical Installation

Perhaps typical of the diesel-operated generating plants is the one at Tehucan, Puebla, which has a rated capacity of 1000 kw. Here power is suplied by three turbocharged Model FS-9 Nordberg diesel engines. Two of them are 7-cyl engines rated at 485 hp at 600 rpm, and one is an 8-cyl unit of 500 hp at 600 rpm. Bore and stroke for these engines is 9 in by 11½ in.

The Nordbergs are direct-connected to the generators and produce 60-cycle 3-phase current. Two generators are Electric Machinery Co. units rated at 350 kw, and the third is a General Electric generator of 300-kw rating. The output is normally held down to 750 kw and leaves the plant through two GE transformers.

Equipment in the Tehucan plant includes Quincy compressors, Blackner fuel pumps, Hoffman oil filters, Air-Maze Type E filters, and Electric Machinery switchboard.

Summary

Mexico has been charged with being "backward" in many respects, and perhaps it is. But the fact that oxen and wooden plows may be used in many regions in lieu of modern farm machinery is no criterion for measuring Mexico's electric power facilities. The diesel plants are as modern and as well-equipped as any in the United States. Much of the credit for that fact must go, of course, to the American representatives of diesel engine manufacturers who are doing the selling in Mexico and assist in the plant layout and installation work.

THE BUYERS' GUIDE

The Buyers' Guide is a service to our readers and to advertisers in Diesel Power and Diesel Transportation. *Here will be found in a convenient list for quick reference diesel engines and accessories advertised in this magazine and a substantial number of other engines and products of leading manufacturers who advertise in this classified directory.*

DIESEL ENGINE DIRECTORY

Two-Cycle Diesel Engines

LOW SPEED, up to 365 r.p.m.

Horsepower, 101 to 500

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

Horsepower, 501 to 1000

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

Horsepower, Over 1000

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio
BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.
NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

MEDIUM SPEED, 365 to 700 r.p.m.

Horsepower, 51 to 100

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

Horsepower, 101 to 500

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.
CLEVELAND DIESEL ENGINE DIVISION
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

Horsepower, 501 to 1000

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

Horsepower, over 1000

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.
NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

MEDIUM HIGH SPEED, 700 to 1200 r.p.m.

Horsepower, 1 to 50

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS CORPORATION
13400 W. Outer Drive
Detroit 28, Michigan
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.
P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

Horsepower, 51 to 100

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.
P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

Horsepower, 101 to 500

CLEVELAND DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
2160 W. 106th St.
Cleveland 11, Ohio
DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.
P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

Horsepower, 501 to 1000

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan
FAIRBANKS, MORSE & CO.
600 S. MICHIGAN AVE.
Chicago 5, Ill.

Horsepower, over 1000

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

HIGH SPEED, over 1200 r.p.m.

Horsepower, 1 to 50

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS CORPORATION
13400 W. Outer Drive
Detroit 28, Michigan
FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

P&H DIESEL DIVISION
HARNISCHFEGER CORP.
500 S. Main St.
Crystal Lake, Ill.

Horsepower, 51 to 100

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

Horsepower, 101 to 500

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

P & H DIESEL DIVISION
HARNISCHFEGER CORP.
500 So. Main St.
Crystal Lake, Illinois

Horsepower, 501 to 1000

DETROIT DIESEL ENGINE DIVN.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Michigan

Four-Cycle Diesel Engines

LOW SPEED, up to 365 r.p.m.

Horsepower, 51 to 100

WHITE-ROTH CORP.
Lorain, Ohio

Horsepower, 101 to 500

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

WORTHINGTON CORP.
Harrison, New Jersey

Horsepower, 501 to 1000

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CHICAGO PNEUMATIC TOOL CO.
6 East 44th Street
N. Y., N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

THE NATIONAL SUPPLY CO.
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Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

WORTHINGTON CORP.
Harrison, New Jersey

MEDIUM SPEED, 365 to 700 r.p.m.

Horsepower, 1 to 50

THE BUDA COMPANY
154th & Commercial Avenues
Harvey, Ill.

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

INTERNATIONAL SELLING CORP.
122 E. 42nd Street
New York 17, N. Y.

WHITE-ROTH CORP.
Lorain, Ohio

Horsepower, 51 to 100

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L.I., New York

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

Horsepower, 101 to 500

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L.I., New York

THE BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CHICAGO PNEUMATIC TOOL CO.
6 East 44th Street
New York, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

WORTHINGTON CORP.
Harrison, New Jersey

Horsepower, 501 to 1000

AMERICAN LOCOMOTIVE COMPANY
Schenectady 5, N. Y.

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L.I., New York

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CHICAGO PNEUMATIC TOOL CO.
6 East 44th Street
N. Y., N. Y.

COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Ave.
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

WORTHINGTON CORP.
Harrison, New Jersey

Horsepower, over 1000

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L.I., New York

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, Calif.

THE NATIONAL SUPPLY COMPANY
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

WORTHINGTON CORP.
Harrison, New Jersey

MEDIUM HIGH SPEED 700 to 1200 r.p.m.

Horsepower, 1 to 50

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, New York

CONTINENTAL MOTORS CORP.
205 Market Street
Muskegon, Michigan

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

WITTE ENGINE WORKS
OIL WELL SUPPLY, DIV.
UNITED STATES STEEL CORP.
1600 Oakand Ave.
Kansas City, Missouri

Horsepower, 51 to 100

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L. I., New York

CONTINENTAL MOTORS CORP.
205 Market Street
Muskegon, Michigan

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco 10, California

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

MURPHY DIESEL CO.
5317 W. Burnham
Milwaukee 14, Wisconsin

Horsepower, 101 to 500

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L. I., New York

BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

CHICAGO PNEUMATIC TOOL CO.
6 East 44th Street
N. Y., N. Y.

CONTINENTAL MOTORS CORP.
205 Market Street
Muskegon, Michigan

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

CUMMINS ENGINE COMPANY, INC.
Columbus, Indiana

ENTERPRISE ENGINE & MACH. CO.
18th & Florida Sts.
San Francisco 10, California

INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.

MURPHY DIESEL CO.
5317 W. Burnham
Milwaukee 14, Wisconsin

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Avenue
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Ave.
Milwaukee 7, Wisconsin

STERLING ENGINE COMPANY
1270 Niagara St.
Buffalo 13, N. Y.

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

Horsepower, 501 to 1000

AMERICAN LOCOMOTIVE COMPANY
Schenectady 5, N. Y.

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L. I., N. Y.

CHICAGO PNEUMATIC TOOL CO.
6 East 44th Street
N. Y., N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

INGERSOLL-RAND CO
11 Broadway
New York 4, N. Y.

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Ave.
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Avenue
Milwaukee 7, Wisconsin

STERLING ENGINE COMPANY
1270 Niagara St.
Buffalo 13, N. Y.

Horsepower, over 1000

AMERICAN LOCOMOTIVE COMPANY
Schenectady 5, N. Y.

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L. I., N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

NORDBERG MFG. CO.
3073 S. Chase Avenue
Milwaukee 7, Wisconsin

HIGH SPEED, over 1200 r.p.m.

Horsepower, 1 to 50

BRUSH ABOE, INC.
60-07 39th Avenue
Woodside 77, L. I., N. Y.

BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CONTINENTAL MOTORS CORP.
205 Market Street
Muskegon, Michigan

HALLETT MFG. CO.
1601 W. Florence Ave.
Inglewood, Calif.

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

GRAY MARINE MOTOR CO.
710 Canton Avenue
Detroit 7, Michigan

THE NATIONAL SUPPLY CO.
ENGINE DIVISION
(Mfgrs. of Superior & Atlas Engines)
1401 Sheridan Ave.
Springfield 99, Ohio

NORDBERG MFG. CO.
3073 S. Chase Avenue
Milwaukee 7, Wisconsin

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

WITTE ENGINE WORKS
OIL WELL SUPPLY, DIV.
UNITED STATES STEEL CORP.
1600 Oakland Ave.
Kansas City, Missouri

Horsepower, 51 to 100

BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

CONTINENTAL MOTORS CORP.
205 Market Street
Muskegon, Michigan

CUMMINS ENGINE CO., INC.
Columbus, Indiana

FAIRBANKS, MORSE & CO.
600 S. Michigan Ave.
Chicago 5, Ill.

GRAY MARINE MOTOR CO.
710 Canton Avenue
Detroit 7, Michigan

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

Horsepower, 101 to 500

BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

CONTINENTAL MOTORS CORP.
205 Market Street
Muskegon, Michigan

CUMMINS ENGINE CO., INC.
Columbus, Indiana

GRAY MARINE MOTOR CO.
710 Canton Avenue
Detroit 7, Michigan

HERCULES MOTORS CORP.
11th & Market S. E.
Canton 2, Ohio

MURPHY DIESEL CO.
5317 W. Burnham
Milwaukee 14, Wisconsin

WAUKESHA MOTOR CO.
P. O. Box 379
Waukesha, Wisconsin

Horsepower, 501 to 1000

CUMMINS ENGINE CO., INC.
Columbus, Indiana

DIESEL PLANT ACCESSORIES

Adapters, Engine Indicator
BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

Additives
WYNN OIL COMPANY
1151 W. 5th St.
Azusa, Calif.

Additives for Diesel Fuel Oil
WYNN OIL COMPANY
1151 W. 5th St.
Azusa, Calif.

Aftercoolers, Air Compressor
See also headings under "Coolers"

AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 1, New York

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

KEWANEE-ROSS CORP.
ROSS HEATER DIVISION
1405 West Avenue
Buffalo 13, New York

JOHN REINER & COMPANY
12-12 37th Avenue
Long Island City 3, New York

YOUNG RADIATOR CO.
Racine, Wisconsin

Aftercoolers, Supercharger
See also "Supercharging Intercoolers"

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

HARRISON RADIATOR DIVISION
GENERAL MOTORS CORPORATION
Washburn Street
Lockport, New York

KEWANEE-ROSS CORPORATION
ROSS HEATER DIVISION
1405 West Avenue
Buffalo 13, New York

YOUNG RADIATOR CO.
Racine, Wisconsin

Air Compressors
See also "Compressors, Air"; "Starting Units"

WORTHINGTON CORPORATION
Harrison, New Jersey

Air Compressors, Diesel Driven
GARDNER-DENVER COMPANY
Quincy, Illinois

Air Compressors, Starting
GARDNER-DENVER COMPANY
Quincy, Illinois

WORTHINGTON CORPORATION
Harrison, New Jersey

Air Dehydrators
J. F. PRITCHARD & COMPANY
210 W. 10 Street
Kansas City 5, Missouri

Air Dryers, Instrument
J. F. PRITCHARD & COMPANY
210 W. 10 Street
Kansas City 5, Missouri

Air Filters
See also "Cleaners"; "Filters, Air"

AIR MAZE CORP.
25000 Miles Road
Cleveland, Ohio

AMERICAN AIR FILTER CO., INC.
Central Avenue
Louisville 8, Kentucky

THE BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.

BURGESS-MANNING COMPANY
749 East Park Avenue
Libertyville, Illinois

CONTINENTAL AIR FILTERS, INC.
P.O. Box 1647
Louisville 1, Kentucky

CUNO ENGINEERING CORPORATION
80 South Vine Street
Meridan, Connecticut

DONALDSON COMPANY, INC.
666 Pelham Blvd.
St. Paul 4, Minnesota

WINSLOW ENGINEERING CO.
4069 Hollis Street
Oakland 8, California

Air Filters, Automatic, Self-Cleaning
AIR MAZE CORP.
25000 Miles Road
Cleveland, Ohio

AMERICAN AIR FILTER CO., INC.
Central Avenue
Louisville 8, Kentucky

CONTINENTAL AIR FILTERS COMPANY
P.O. Box 1647
Louisville 1, Kentucky

Air Filters, Crankcase
See also headings under "Breathers"

FRAM CORP.
Providence 16, R. I.

Air Starting Motor, Diesel Engine
See also "Starting Motors, Diesel Air" "Cranking Motors, Air"

GARDNER-DENVER COMPANY
Quincy, Illinois

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Air Tools
INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

Air Velocity Meters
BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle Street
Chicago 10, Ill.

Alarm Systems, Pressure & Temperature
See also headings under "Controls & Automatic"

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee

PENN CONTROLS, INC.
Goshen, Indiana

SYNCHRO-START PRODUCTS, INC.
8151 North Ridgeway Ave.
Skokie, Illinois

Alloy Steel Bolts & Nuts
ERIE BOLT & NUT CO.
1325 Liberty Street
Erie, Pa.

Alternators
DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Avenue
Anderson, Indiana

ELLIOTT COMPANY
Jeannette, Pa.

LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Ammeters
See also "Meters, Electrical Indicating".

BURLINGTON INSTRUMENT CO.
203 N. 3rd St.
Burlington, Iowa

WESTON ELECTRICAL INSTRUMENT CO.
614 Frelinghuysen Ave.
Newark 5, N. J.

Ammeters—Tong Test (Clamp On) Type
COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio

WESTON ELECTRICAL INSTRUMENT CO.
614 Frelinghuysen Ave.
Newark 5, N. J.

Anti-Rust Compounds
See also "Rust Preventatives"

CITIES SERVICE OIL CO.
70 Pine Street
New York 5, N. Y.

Asbestos, Sheet
See also headings under "Gaskets"

THE ANCHOR PACKING CO.
401 N. Broad St.
Philadelphia 8, Pa.

FITZGERALD MFG. COMPANY
Torrington, Connecticut

VICTOR MFG. & GASKET CO.
5750 Roosevelt Ave.
Chicago, Illinois

Automatic Controls Hydraulic
GRAY MARINE MOTOR COMPANY
710 Canton Avenue
Detroit 7, Michigan

Automatic Controls, Starting
SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

Automatic Controls, Temperature
See also "Alarm Systems"

AMERICAN MOTORS COMPANY
First & Nevin Avenue
Richmond 5, California

DETROIT CONTROLS CORP.
5900 Trumbull Ave.
Detroit, Michigan

GRAY MARINE MOTOR COMPANY
710 Canton Avenue
Detroit 7, Michigan

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee

PENN CONTROLS, INC.
Goshen, Indiana

THE POWERS REGULATOR CO.
3400 Oakton
Skokie, Illinois

Automatic Transmissions
ALLISON DIVISION
GENERAL MOTORS CORP.
Indianapolis, Indiana

Automotive Diesel Fuel

See also "Fuel Oil, Diesel"; "Oils, Diesel Fuel"; "Diesel Fuel Oils"; "Motor Fuels"

STANDARD OIL COMPANY OF CALIF.
225 Bush Street
San Francisco 20, California

THE TEXAS COMPANY
135 East 42nd Street
New York 17, N. Y.

Automotive Greases

See also "Greases," "Lubricants"

THE PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois

STANDARD OIL COMPANY OF CALIF.
225 Bush Street
San Francisco 20, California

THE TEXAS COMPANY
135 E. 42nd Street
New York 17, N. Y.

Automotive Lubricating Oils

See also "Lubricating Oils"

PURE OIL COMPANY
35 East Wacker Drive
Chicago, Illinois

STANDARD OIL COMPANY OF CALIF.
225 Bush Street
San Francisco 20, California

THE TEXAS COMPANY
135 East 42nd Street
New York 17, N. Y.

Auxiliary Combination Units

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, New York

JOHN REINER & CO.
12-12 37th Avenue
Long Island City 3, New York

Auxiliary Diesel Generating Sets

See also "Diesel Generating Sets"; "Emergency Diesel Generator"; "Emergency Lighting Plants".

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, New York

DIESEL DIVISION
NATIONAL METAL & STEEL CORP.
Dept. P, 1251 New Dock Street
Terminal Island Station
Los Angeles, Calif.

NORDBERG MANUFACTURING CO.
3073 South Chase Avenue
Milwaukee, Wisconsin

JOHN REINER & COMPANY
12-12 37th Avenue
Long Island City 3, New York

R. H. SHEPPARD COMPANY, INC.
201 Middle Street
Hanover, Pennsylvania

Ball & Roller Bearing Greases

TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

Bars, Bronze

See also headings under "Bronze"

THE BUNTING BRASS & BRONZE CO.
715 Spencer Street
Toledo 1, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

Batteries, Nickel Cadmium, Storage

NIFE, INCORPORATED
P.O. Box 187
Copiague, Long Island, New York

Batteries, Storage

CRESCENT BATTERY & LIGHT CO., INC.
819 Magazine Street
New Orleans, La.

DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Avenue
Anderson, Indiana

ELECTRIC STORAGE BATTERY CO.
42 South 15 Street
Philadelphia 2, Pa.

SURRETTE STORAGE BATTERY CO., INC.
Jefferson Avenue
Salem, Mass.

WILLARD STORAGE BATTERY COMPANY
246 East 131 Street
Cleveland 1, Ohio

Battery Charging Regulator

ELECTRIC REGULATOR CORP.
Pearl Street
Norwalk, Connecticut

Battery Service Accessories

CRESCENT BATTERY & LIGHT CO., INC.
819 Magazine Street
New Orleans, La.

ELECTRIC STORAGE BATTERY CO.
42 South 15 Street
Philadelphia 2, Pa.

Bearings

THE BUNTING BRASS & BRONZE CO.
715 Spencer Street
Toledo 1, Ohio

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

Bearings, Aluminum

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE COMPANY
470 South Mill Street
New Castle, Pennsylvania

Bearings, Babbitted

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, New York

THE BUNTING BRASS & BRONZE CO.
715 Spencer Street
Toledo 1, Ohio

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE COMPANY
470 S. Mill Street
New Castle, Pennsylvania

Bearings, Babbitted and Bronze Bushed

THE BUNTING BRASS & BRONZE CO.
715 Spencer Street
Toledo 1, Ohio

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE COMPANY
470 S. Mill Street
New Castle, Pennsylvania

Bearings, Bronze

See also "Bronze Bearings"

THE BUNTING BRASS & BRONZE CO.
715 Spencer Street
Toledo 1, Ohio

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE COMPANY
470 South Mill Street
New Castle, Pennsylvania

Bearings, Bronze and Steel Backed, Babbitt-Lined

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE COMPANY
470 South Mill Street
New Castle, Pennsylvania

Bearings, Copper-Lead

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE COMPANY
470 S. Mill Street
New Castle, Pennsylvania

Bearings, Lead, Bronze

THE BUNTING BRASS & BRONZE CO.
715 Spencer Street
Toledo 1, Ohio

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

Bearings, Piston Pin

See "Bearings Wrist Pin"

THE BUNTING BRASS & BRONZE CO.
715 Spencer Street
Toledo 1, Ohio

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

FEDERAL-MOGUL CORPORATION
11031 Shoemaker Ave.
Detroit 13, Michigan

JOHNSON BRONZE COMPANY
470 South Mill Street
New Castle, Pennsylvania

Bearings Pullers

SNAP-ON TOOLS CORP.
Kenosha, Wisconsin

Bearings, Self-Lubricating

THE BUNTING BRASS & BRONZE CO.
715 Spencer Street
Toledo 1, Ohio

CLEVELAND GRAPHITE BRONZE CO.
17000 St. Clair Ave.
Cleveland, Ohio

JOHNSON BRONZE COMPANY
470 South Mill Street
New Castle, Pennsylvania

Bearings, Sleeve, Copper-Lead Lined

FEDERAL-MOGUL CORP.
11031 Shoemaker Avenue
Detroit 13, Michigan

Bearings, Special Alloys

THE BUNTING BRASS & BRONZE CO.
715 Spencer Street
Toledo, Ohio

Bearings, Steel-Backed, Copper-Lead Lined

FEDERAL-MOGUL CORP.
11031 Shoemaker Avenue
Detroit 13, Michigan

Bearings, Wrist Pin

See also "Bearings, Piston Pin"

THE BUNTING BRASS & BRONZE CO.
715 Spencer Street
Toledo, Ohio

Blowers, Centrifugal

ELLIOTT COMPANY
Jeannette, Pennsylvania
SCHWITZER-CUMMINS CO.
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Blowers, Rotary, Positive

INTERSTATE DIESEL SERVICE, INC.
7120 Carnegie Avenue
Cleveland 3, Ohio
MIEHLE-DEXTER SUPERCHARGER DIVN.
THE DEXTER FOLDER COMPANY
Racine, Wisconsin
READ STANDARD CORPORATION
370 Lexington Avenue
New York 17, N. Y.

Blowers, Scavenging and Supercharging

ELLIOTT COMPANY
Jeannette, Pennsylvania
MIEHLE-DEXTER SUPERCHARGER DIVN.
THE DEXTER FOLDER COMPANY
Racine, Wisconsin
READ STANDARD CORPORATION
370 Lexington Avenue
New York 17, N. Y.

Boilers, Exhaust Gas, Waste Heat

See also "Waste Heat Boilers"

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York
THE SIMS COMPANY
Erie, Pa.

Bolts

ERIE BOLT & NUT CO.
1325 Liberty Street
Erie, Pa.

Brazing Equipment Induction

OHIO CRANKSHAFT COMPANY
3800 Harvard Ave.
Cleveland 1, Ohio

Breather Filters

See also, "Air Filters, Crankcase"

AIR MAZE CORP.
25000 Miles Road
Cleveland, Ohio
DONALDSON CO., INC.
666 Pelham Blvd.
St. Paul 4, Minn.
WINSLOW ENGINEERING CO.
4069 Hollis Street
Oakland 8, California

Bronze Bar Stock, Semi Finished

FEDERAL-MOGUL CORP.
11031 Shoemaker Avenue
Detroit 13, Michigan

Bronze Bar Stock

THE BUNTING BRASS & BRONZE CO.
715 Spencer Street
Toledo, Ohio
JOHNSON BRONZE COMPANY
470 South Mill Street
New Castle, Pennsylvania

Bronze Bearings

See also "Bearings, Bronze"

THE BUNTING BRASS & BRONZE CO.
715 Spencer Street
Toledo, Ohio
FEDERAL-MOGUL CORP.
11031 Shoemaker Avenue
Detroit 13, Michigan

Bronze Washers

THE BUNTING BRASS & BRONZE CO.
715 Spencer Street
Toledo, Ohio
FEDERAL-MOGUL CORP.
11031 Shoemaker Avenue
Detroit 13, Michigan

Burner Oils

MID-CONTINENT PETROLEUM CORP.
Box 381
Tulsa 2, Oklahoma

Bushings, Bronze

THE BUNTING BRASS & BRONZE CO.
715 Spencer Street
Toledo, Ohio
FEDERAL-MOGUL CORP.
11031 Shoemaker Avenue
Detroit 13, Michigan
JOHNSON BRONZE COMPANY
470 South Mill Street
New Castle, Pennsylvania

Bushings, High-Lead Bronze

THE BUNTING BRASS & BRONZE CO.
715 Spencer Street
Toledo, Ohio
FEDERAL-MOGUL CORP.
11031 Shoemaker Avenue
Detroit 13, Michigan

Bushings, Lead-Bronze Lined

FEDERAL-MOGUL CORP.
11031 Shoemaker Avenue
Detroit 13, Michigan

Bushings, Steel-Backed, Babbitt-Lined

FEDERAL-MOGUL CORP.
11031 Shoemaker Avenue
Detroit 13, Michigan

Cables, Battery

THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio
WILLARD STORAGE BATTERY CO.
246 East 131 Street
Cleveland 1, Ohio

Cam Followers

EATON MANUFACTURING CO.
740 East 140th Street
Cleveland 10, Ohio

Camshafts Drives, Roller Chain Type

MORSE CHAIN CO.
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Michigan

Camshaft Grinders

VAN NORMAN COMPANY
3640 Main Street
Springfield, Mass.

Camshafts, Finished

OHIO CRANKSHAFT COMPANY
3800 Harvard Avenue
Cleveland 1, Ohio

Camshafts, Reground

NATIONAL WELDING & GRINDING CO.
2929 Canton Street
Dallas 1, Texas

Camshafts, Repaired

NATIONAL WELDING & GRINDING CO.
2929 Canton Street
Dallas 1, Texas

Carbon Brushes

NATIONAL CARBON COMPANY
DIVISION OF UNION CARBIDE & CARBON CORP.
30 East 42nd Street
New York, New York

Carbon Solvents

OAKITE PRODUCTS, INC.
22C Rector Street
New York 6, New York
TURCO PRODUCTS, INC.
6135 South Central Ave.
Los Angeles, Calif.

Casting, Bi-Metallic

FAIRCHILD ENGINE & AIRPLANE CORP.
ENGINE DIVISION
Hagerstown, Maryland

Castings

HUNT-SPILLER MFG. COMPANY
383 Dorchester Avenue
Boston 27, Mass.

Castings, Alloy Iron

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

Castings, Bronze & Brass

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

Castings, Grey Iron

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio
EATON MANUFACTURING CO.
740 East 140th Street
Cleveland 10, Ohio

Casting Repairs

WASHINGTON IRON WORKS
Sherman, Texas

Castings, Steel (Med & Large)

ERIE FORGE & STEEL CORPORATION
15 & Cascade Streets
Erie, Pennsylvania

Centrifugal Purifiers, Lube & Fuel Oil

See also headings under "Conditioners"; "Purifiers"; and "Separators"

CENTRICO, INC.
75 W. Forest Ave.
Englewood, New Jersey

THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.
THE SHARPLES CORP.
2300 Westmoreland St.
Philadelphia 40, Pa.

Centrifugal Residual Oil Purifying

THE SHARPLES CORPORATION
2300 Westmoreland Street
Philadelphia, Pennsylvania

Centrifuges, Oil Purifying

See heading above.

CENTRICO, INC.
75 W. Forest Ave.
Englewood, New Jersey
THE DE LAVAL SEPARATOR CO.
Poughkeepie, N. Y.
THE SHARPLES CORP.
2300 Westmoreland St.
Philadelphia 40, Pa.

Chain Drives, Complete

DIAMOND CHAIN CO., INC.
494 Kentucky Avenue
Indianapolis 7, Indiana
LINK-BELT COMPANY
220 S. Belmont Avenue
Indianapolis 6, Indiana
MORSE CHAIN COMPANY
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Michigan

Chains, Control

DIAMOND CHAIN CO., INC.
494 Kentucky Avenue
Indianapolis 7, Indiana

Chains, Dual Engine Drive

DIAMOND CHAIN CO., INC.
494 Kentucky Avenue
Indianapolis 7, Indiana
LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana
MORSE CHAIN COMPANY
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Michigan

Chains, Power Transmission

DIAMOND CHAIN COMPANY, INC.
494 Kentucky Avenue
Indianapolis 7, Indiana
LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana
MORSE CHAIN COMPANY
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Michigan

Chains, Roller

DIAMOND CHAIN COMPANY, INC.
494 Kentucky Avenue
Indianapolis 7, Indiana
LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana
MORSE CHAIN COMPANY
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Michigan

Chains, Silent

DIAMOND CHAIN CO., INC.
494 Kentucky Avenue
Indianapolis 7, Indiana
LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

Chains, Timing

DIAMOND CHAIN COMPANY, INC.
494 Kentucky Avenue
Indianapolis 7, Indiana
LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana
MORSE CHAIN CO.
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Michigan

Chargers, Battery

ELECTRIC STORAGE BATTERY CO.
42 South 15 Street
Philadelphia 2, Pa.
WILLARD STORAGE BATTERY CO.
246 East 131 Street
Cleveland 1, Ohio

Chasers, Hand Thread

SNAP-ON TOOLS CORP.
Kenosha, Wisconsin

Chromium Plating

KOPPERS COMPANY, INC.
METAL PRODUCTS DIVISION
P.O. Box 298
Baltimore 3, Maryland
SPAR-TAN ENGINEERING CO.
Western Licensee—Van Der Horst Corp.
2445 Enterprise Street
Los Angeles 21, Calif.
VAN DER HORST CORP. OF AMERICA
P.O. Box 557
Olean, N. Y.

Chromium Treated Parts

KOPPERS COMPANY, INC.
METAL PRODUCTS DIVISION
200 Scott Street
Baltimore 3, Maryland

Clarifiers, Oil

See also headings under "Centrifugal Purifiers"; "Separators"

BOWSER, INCORPORATED
Fort Wayne 2, Indiana
THE BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.
CENTRICO, INC.
75 W. Forest Ave.
Englewood, New Jersey
THE HILLIARD CORP.
120 West Fourth Street
Elmira, New York
HONAN-CRANE CORPORATION
SUBSIDIARY OF HOUDAILLE-HERSEY CORP.
305 Wabash Avenue
Lebanon, Indiana
LUBER-FINER INC.
2514 South Grand Avenue
Los Angeles, California
U.S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
219 Lamson Street
Syracuse 6, New York
WINSLOW ENGINEERING CO.
4069 Hollis Street
Oakland 8, California

Cleaner, Waterless, Hand

ENGINE LIFE PRODUCTS CORP.
115 South Granada Avenue
El Monte, California

Cleaners, Air, Oil Bath Type

See also headings under "Filters, Air" and "Silencers"

DONALDSON COMPANY, INC.
666 Pelham Boulevard
St. Paul 4, Minnesota

Cleaners, Dry Type

BURGESS-MANNING COMPANY
749 East Park Avenue
Libertyville, Illinois

Cleaning Compounds

See also "Cleaners"

OAKITE PRODUCTS, INC.
22 C Rector Street
New York 6, N. Y.
TURCO PRODUCTS, INC.
6135 South Central Ave.
Los Angeles, Calif.

Clutch Discs

ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Avenue
Rockford, Illinois

Clutches

THE HILLIARD CORPORATION
120 West Fourth Street
Elmira, New York
MORSE CHAIN CO.
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Michigan
ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Ave.
Rockford, Illinois

Clutches, Automotive

MORSE CHAIN CO.
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Michigan
ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Avenue
Rockford, Illinois

Clutches, Free Wheeling

THE HILLIARD CORPORATION
120 West Fourth Street
Elmira, New York
MORSE CHAIN CO.
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Michigan

Clutches, Friction and Jaw

THE HILLIARD CORPORATION
120 West Fourth Street
Elmira, New York
MORSE CHAIN CO.
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Michigan
ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Avenue
Rockford, Illinois

Clutches, Hydraulic

GRAY MARINE MOTOR CO.
710 Canton Avenue
Detroit 7, Michigan

Clutches, Power Transmission

THE HILLIARD CORPORATION
120 West Fourth Street
Elmira, New York
MORSE CHAIN CO.
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Michigan

ROCKFORD CLUTCH DIVISION
BORG-WARNER CORP.
1301 18th Avenue
Rockford, Illinois

THE SNOW- NABSTEDT GEAR CORP.
351 Welton Street
Hamden 7, Conn.

Combustion, Diesel

LANOVA CORP.
38-15 30th Street
Long Island City 1, N. Y.

Combustion Systems, Designs

LANOVA CORP.
38-15 30th St.
Long Island City 1, N. Y.

Combustion Systems, Tests

LANOVA CORP.
38-15 18th Avenue
Long Island City 1, N. Y.

Compression Testers, Diesel Engine

See also "Indicators, Diesel Engine".

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Ave.
Franklin Park, Illinois

Compressors, Air

See also "Air Compressors"; "Starting Units"

CHICAGO PNEUMATIC TOOL CO.
6 East 44th Street
New York, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

GARDNER-DENVER COMPANY
Quincy, Illinois

MIEHLE-DEXTER SUPERCHARGER DIVN.
THE DEXTER FOLDING COMPANY
Racine, Wisconsin

QUINCY COMPRESSOR CO.
217 Maine Street
Quincy, Illinois

READ STANDARD CORP.
370 Lexington Ave.
New York 17, N. Y.

JOHN REINER & COMPANY
12-12 37th Avenue
Long Island City 3, New York

WORTHINGTON CORP.
Harrison, New Jersey

Compressor Oils

MID-CONTINENT PETROLEUM CORP.
Box 381
Tulsa 2, Oklahoma

Compressors, Reciprocating, Air and Gas, All Drives

CHICAGO PNEUMATIC TOOL CO.
6 East 44th Street
New York, N. Y.

THE COOPER-BESSEMER CORP.
Mt. Vernon, Ohio

GARDNER-DENVER COMPANY
Quincy, Illinois

INGERSOLL-RAND CO.
11 Broadway
New York 4, N. Y.

JOHN REINER & COMPANY
12-12 37th Avenue
Long Island City 3, New York

WORTHINGTON CORP.
Harrison, New Jersey

Condensers

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

Condensers, Atmospheric Evaporative Steam & Vapor

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Conditioners, Fuel & Lube Oil

See also "Centrifugal Purifiers"; "Purifiers"; "Separators"

BOWSER, INC.
Fort Wayne 2, Indiana

THE BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.

HILLIARD CORPORATION
120 West 4th Street
Elmira, N. Y.

WM. W. NUGENT & CO., INC.
410-412 N. Hermitage Ave.
Chicago 22, Illinois

U. S. HOFFMAN MACHINERY CORP.
INDUSTRIAL FILTRATION DIVISION
219 Lamson Street
Syracuse, New York

WINSLOW ENGINEERING CO.
4059 Hollis Street
Oakland 8, California

Connecting Rods

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

Connecting Rod Borers

VAN NORMAN COMPANY
3640 Main Street
Springfield, Massachusetts

Connecting Rod Pin Bushing Borer

LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

VAN NORMAN COMPANY
3640 Main Street
Springfield, Massachusetts

Connecting Rod Rebuilding Service

CLEVELAND HONE & MANUFACTURING CO.
8816 Harkness Road
Cleveland 6, Ohio

Connecting Rods, Bolts & Nuts

ERIE BOLT & NUT CO.
1325 Liberty St.
Erie, Pa.

Connecting Rods, Forged

ERIE FORGE & STEEL CORPORATION
15 & Cascade Streets
Erie, Pennsylvania

Controls, Automatic Starting

See also "Automatic Controls"; "Alarm Systems"

AUTOMATIC SWITCH CO.
391 Lakeside Avenue
Orange, New Jersey

SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Ave.
Skokie, Illinois

UNIVERSAL AUTOMATIC ENGINE CONTROLLER
53 West Jackson Blvd.
Chicago 4, Illinois

Controls, Engine Safety

DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin

FULTON-SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee

PENN CONTROLS, INC.
Goshen, Indiana

PIERCE GOVERNOR COMPANY
1625 Ohio Ave.
Anderson, Indiana

SYNCHRO-START PRODUCTS INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

Controls, Fuel Governing Reverse Gear

THE MORSE INSTRUMENT CO.
21 Clinton Street
Hudson, Ohio

PIERCE GOVERNOR COMPANY
1625 Ohio Ave.
Anderson, Indiana

PANISH CONTROLS
191-203 Bennett Street
Bridgeport 5, Conn.

Controls, Hydraulic

GRAY MARINE MOTOR COMPANY
710 Canton Avenue
Detroit 7, Michigan

Controls, Power, Air, Hydraulic Vacuum, Electric

PANISH CONTROLS
191-203 Bennett Street
Bridgeport 5, Conn.

Controls, Pressure

PENN CONTROLS, INC.
Goshen, Indiana

Controls, Remote

THE MORSE INSTRUMENT CO.
21 Clinton Street
Hudson, Ohio

PANISH CONTROLS
191-203 Bennett Street
Bridgeport 5, Conn.

SYNCHRO-START PRODUCTS, INC.
8151 North Ridgeway Avenue
Skokie, Illinois

Controls, Remote Throttle

THE MORSE INSTRUMENT CO.
21 Clinton Street
Hudson, Ohio

PANISH CONTROLS
191-203 Bennett Street
Bridgeport 5, Conn.

SYNCHRO-START PRODUCTS, INC.
8151 North Ridgeway Avenue
Skokie, Illinois

Controls, Temperature

AMERICAN MOTORS CO.
21 Nevins Avenue
Richmond 5, California

DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee

ILLINOIS TESTING LABORATORIES, INC.
420 North LaSalle Street
Chicago 10, Illinois

PENN CONTROLS, INC.
Goshen, Indiana

THE POWERS REGULATOR CO.
3410 Oakton St.
Skokie, Illinois

Controls Underwriter's

UNIVERSAL AUTOMATIC ENGINE CONTROLLER
53 West Jackson Blvd.
Chicago 4, Illinois

Controls, Vacuum

GRAY MARINE MOTOR COMPANY
710 Canton Avenue
Detroit 7, Michigan

Coolers, Compressed Air, Gas

See also "Aftercoolers"

AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 4, N. Y.

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

KEWANEE-ROSS CORP.
ROSS HEATER DIVISION
1405 West Avenue
Buffalo 13, New York

YOUNG RADIATOR CO.
Racine, Wisconsin

Coolers, Evaporative Type

See headings under "Evaporators".

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Coolers, Jacket Water

See also "Exchangers, Heat"; "Water Cooling Equipment"; and headings under "Heat Exchangers".

AEROFIN CORPORATION
410 S. Geddes St.
Syracuse 1, N. Y.

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

THE FLUOR CORP., LTD.
2500 South Atlantic Blvd.
Los Angeles, Calif.

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York

KEWANEE-ROSS CORP.
ROSS HEATER DIVISION
1405 West Avenue
Buffalo 13, New York

J. F. PRITCHARD & CO.
210 West 10 Street
Kansas City 5, Missouri

YOUNG RADIATOR CO.
Racine, Wisconsin

Coolers, Jacket Water, Materials For Cleaning

See also "Cleaning Compounds"; "Cleaners"; "Exchangers"

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

YOUNG RADIATOR CO.
Racine, Wisconsin

Coolers, Lube Oil, Materials For Cleaning

KEWANEE-ROSS CORP.
ROSS HEATER DIVISION
1405 West Avenue
Buffalo 13, New York

YOUNG RADIATOR COMPANY
Racine, Wisconsin

Coolers, Oil Water

See also "Oil Coolers"; "Water Cooling Equipment"; "Exchangers, Heat" and headings under "Heat Exchangers".

AEROFIN CORPORATION
410 S. Geddes St.
Syracuse 1, N. Y.

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York

KEWANEE-ROSS CORP.
ROSS HEATER DIVISION
1405 West Avenue
Buffalo 13, New York

YOUNG RADIATOR CO.
Racine, Wisconsin

Cooling Equipment, Engine Radiators

YOUNG RADIATOR CO.
Racine, Wisconsin

Cooling, Fresh Water

GRAY MARINE MOTOR COMPANY
710 Canton Avenue
Detroit 7, Michigan

Cooling Towers

See also "Spray Towers".

THE FLUOR CORP., LTD.
2500 South Atlantic Blvd.
Los Angeles, Calif.

J. F. PRITCHARD & CO.
210 W. 10th Street
Kansas City 5, Missouri

Cooling Tower Fans

J. F. PRITCHARD & CO.
210 W. 10 St.
Kansas City 5, Missouri

Cooling Water Treating Chemicals

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

Core Oils

CITIES SERVICE OIL CO.
70 Pine Street
New York, N. Y.

Cork Insolation

THE KORFUND CO., INC.
48-20A 32nd Place
Long Island City 1, N. Y.

Couplings

MORSE CHAIN COMPANY
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Michigan

THOMAS FLEXIBLE COUPLING CO.
Main Avenue & Biddle Street
Warren, Pennsylvania

Couplings, Chain

LINK-BELT CO.
220 So. Belmont Ave.
Indianapolis, Ind.

MORSE CHAIN COMPANY
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Michigan

Couplings, Flexible

AJAX FLEXIBLE COUPLING CO., INC.
Westfield, New York

DIAMOND CHAIN CO., INC.
494 Kentucky Avenue
Indianapolis 7, Indiana

ELLIOTT COMPANY
Jeannette, Pennsylvania

KOPPERS CO., INC.
METAL PRODUCTS DIVISION
P.O. Box 298
Baltimore 3, Maryland

MORSE CHAIN COMPANY
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 7, Michigan

THOMAS FLEXIBLE COUPLING CO.
P. O. Box 658
Warren, Pennsylvania

Couplings, Flexible Shaft

DIAMOND CHAIN COMPANY, INC.
494 Kentucky Avenue
Indianapolis 7, Indiana

KOPPERS CO., INC.
METAL PRODUCTS DIVISION
P.O. Box 298
Baltimore 3, Maryland

THOMAS FLEXIBLE COUPLING CO.
Main Avenue & Biddle Street
Warren, Pa.

Couplings, Floating Shaft Type

MORSE CHAIN COMPANY
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Michigan

THOMAS FLEXIBLE COUPLING CO.
P.O. Box 658
Warren, Pa.

Couplings, Hydraulic

AEROQUIP CORPORATION
300 South East Avenue
Jackson, Michigan

THE WEATHERHEAD COMPANY
300 East 131st Street
Cleveland 8, Ohio

Couplings, Hydraulic Pipe

THE WEATHERHEAD COMPANY
300 East 131st Street
Cleveland 8, Ohio

Couplings, Hydraulic Self Sealing

AEROQUIP CORPORATION
300 South East Avenue
Jackson, Michigan

DIAMOND CHAIN COMPANY, INC.
494 Kentucky Ave.
Indianapolis 7, Indiana

Couplings, Hydraulic Self Sealing Quick Disconnect

AEROQUIP CORPORATION
300 South East Avenue
Jackson, Michigan

Couplings, Pneumatic

THE WEATHERHEAD COMPANY
300 East 131st Street
Cleveland 8, Ohio

Couplings, Roller Chain

DIAMOND CHAIN CO., INC.
494 Kentucky Avenue
Indianapolis 7, Indiana

LINK-BELT COMPANY
220 S. Belmont Avenue
Indianapolis 6, Indiana

MORSE CHAIN COMPANY
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Michigan

Couplings, Self-Aligning

DIAMOND CHAIN CO., INC.
494 Kentucky Avenue
Indianapolis 7, Indiana

THOMAS FLEXIBLE COUPLING CO.
Main Avenue & Biddle Street
Warren, Pennsylvania

Couplings, Slip

EATON MANUFACTURING CO.
740 East 140th Street
Cleveland 10, Ohio

Cranking Motors, Air

See also "Air Starting Motors"; "Starting Motors, Air"

LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Cranking Motors, Electric

See also "Starting Motors, Electric"

LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Crankshaft Grinders

CLEVELAND HONE & MFG. CO.
8816 Harkness Road
Cleveland 6, Ohio

LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

VAN NORMAN CO.
3640 Main Street
Springfield 7, Mass.

Crankshaft Machinists

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, New York

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

WASHINGTON IRON WORKS
Sherman, Texas

Crankshafts

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

ERIE FORGE & STEEL COMPANY
15 & Cascade Streets
Erie, Pennsylvania

WYMAN-GORDON COMPANY
105 Madison Street
Worcester, Mass.

Crankshafts Built-Up to Standard

BRODIE SYSTEM
115 Clifton Place
Brooklyn 38, New York

Crankshafts Finished

OHIO CRANKSHAFT COMPANY
3800 Harvard Avenue
Cleveland 1, Ohio

Crankshafts, Emergency Repairs

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, New York

Crankshaft Hard Chrome Plating

CLEVELAND HONE & MFG. CO.
8816 Harkness Road
Cleveland 6, Ohio

Crankshafts, Refinished in Place

BRODIE SYSTEM
115 Clifton Place
Brooklyn 38, New York

Crankshafts Reground

BRODIE SYSTEM
115 Clifton Place
Brooklyn 38, New York

NATIONAL WELDING & GRINDING CO.
2929 Canton Street
Dallas 1, Texas

Crankshafts, Repairs

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.

NATIONAL WELDING & GRINDING COMPANY
2929 Canton Street
Dallas 1, Texas

WASHINGTON IRON WORKS
Sherman, Texas

Cutting Fluids

GULF OIL CORPORATION
GULF REFINING COMPANY
P.O. Box 1166
Pittsburgh 30, Pennsylvania

MID-CONTINENT PETROLEUM CORP.
P.O. Box 361
Tulsa 2, Oklahoma

THE PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois

SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, N. Y.

THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

Cutting Oils

GULF OIL CORPORATION
GULF REFINING COMPANY
P.O. Box 1166
Pittsburgh 30, Pennsylvania

PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois

SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, New York

STANDARD OIL CO. (INDIANA)
910 So. Michigan Avenue
Chicago 80, Ill.

TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, N. Y.

Cylinder Block Head Grinders

VAN NORMAN COMPANY
3640 Main Street
Springfield, Mass.

Cylinder Boring Bars

CEDAR RAPIDS ENGINEERING CO.
902 17th Street, N. E.
Cedar Rapids, Iowa

Cylinder Heads

HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.

Cylinder Hones

WATERBURY TOOL DIVISION
VICKERS, INCORPORATED
172 East Aurora Street
Waterbury, Connecticut

Cylinder Liners

See also "Liners, Diesel Cylinder" and "Centrifugally Cast Cylinder Liners".

THE OHIO PISTON COMPANY
5340 Hamilton Avenue
Cleveland 14, Ohio

SEALED POWER CORP.
2001 Sanford St.
Muskegon 61, Michigan

Cylinder Liners, Porous Chrome Reclaiming

SPAR-TAN ENGINEERING CO.
Western Licensee-Van Der Horst Corp.
2445 Enterprise Street
Los Angeles 21, California

VAN DER HORST CORP. OF AMERICA
Olean, New York

Cylinder Liners Reclaimed

G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts

Cylinder Repairs

WASHINGTON IRON WORKS
Sherman, Texas

Cylinder Sleeves

THE OHIO PISTON COMPANY
5340 Hamilton Avenue
Cleveland 14, Ohio

SEALED POWER CORP.
2001 Sanford Street
Muskegon 61, Michigan

Cylinder, Bored & Finished

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, New York

Damper, Torsional Vibration

See also "Vibration"

SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Dehydrators, Diesel Fuel

BOWSER, INCORPORATED
Fort Wayne, Indiana

WARNER LEWIS COMPANY
P. O. Box 3096
Tulsa 8, Oklahoma

Detergents

OAKITE PRODUCTS, INC.
22 C Rector Street
New York 6, N. Y.

STANDARD OIL CO. (INDIANA)
910 So. Michigan Avenue
Chicago 80, Ill.

Development, Diesel Engine

LANOVA CORP.
38-15 30th Street
Long Island City 1, N. Y.

Dew Point Meters

ILLINOIS TESTING LABORATORIES, INC.
420 North LaSalle Street
Chicago 10, Illinois

Diesel Engine Lubricating Oil

See also "Lubricating Oils"; "Cylinder Oil"

ASHLAND OIL & REFINING COMPANY
Ashland, Kentucky

GULF OIL CORPORATION
GULF REFINING COMPANY
P.O. Box 1166
Pittsburgh 30, Pennsylvania

STANDARD OIL CO. OF CALIFORNIA
225 Bush Street
San Francisco, Calif.

THE TEXAS COMPANY
135 East 42nd Street
New York 17, N. Y.

Diesel Engines, Reconditioned

See also "Diesel Repairs" and "Repairs Diesel".

ANDERSON-O'BRIEN COMPANY
746 East Washington Blvd.
Los Angeles 21, California

BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.

CLEVELAND DIESEL ENGINE DIVISION
GENERAL MOTORS CORPORATION
2160 West 106th Street
Cleveland 11, Ohio

DIESEL DIVISION
NATIONAL METAL & STEEL
Dept. P. 1251 New Dock Street
Terminal Island Station
Los Angeles, California

A. G. SHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.
WASHINGTON IRON WORKS
Sherman, Texas

Diesel Exhaust Smoke Meters

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

Diesel Forklift Trucks

THE BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois

Diesel Farm Tractors

R. H. SHEPPARD COMPANY, INC.
201 Middle Street
Hanover, Pennsylvania

Diesel Fuel Oil

See also "Automotive Diesel Fuel"; "Fuel Oil, Diesel"; "Oils, Diesel Fuel"; "Motor Fuels".

ASHLAND OIL & REFINING COMPANY
Ashland, Kentucky
GULF OIL CORP.
GULF REFINING CO.
P.O. Box 1166
Pittsburgh 30, Pa.
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, New York
TEXAS COMPANY
135 East 42nd Street
New York 17, New York
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, New York

Diesel Fuel Pump Calibrating Stands

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

Diesel Generating Sets

See also "Auxiliary Diesel Generating Sets"; "Emergency Diesel Generators"; "Emergency Lighting Plants"; "Packaged Generators".

AMERICAN LOCOMOTIVE CO.
Schenectady, New York
ANDERSON-O'BRIEN COMPANY
746 East Washington Blvd.
Los Angeles 21, California
BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio
THE BUDA COMPANY
154 & Commercial Avenues
Harvey, Illinois
BURMEISTER & WAIN AMERICAN CORPORATION
17 Battery Place
New York 4, New York
CLEVELAND DIESEL ENGINE DIVISION
GENERAL MOTORS CORPORATION
2160 West 106th Street
Cleveland 11, Ohio
CONSOLIDATED DIESEL ELECTRIC CORP.
(Box 1353) Canal & Ludlow Sts.
Stamford, Conn.
CUMMINS ENGINE CO., INC.
Columbus, Indiana
DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.
ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco 10, Calif.
FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois
1601 West Florence Avenue
HALLETT MANUFACTURING COMPANY
Inglewood, California
P & H DIESEL DIVISION
HARNISCHFEGER CORPORATION
500 So. Main St.
Crystal Lake, Illinois
INGERSOLL-RAND COMPANY
11 Broadway
New York 4, New York
NATIONAL METAL & STEEL CORP.
DIESEL DIVISION
Dept. P. 1251 New Dock St.
Terminal Island Station
Los Angeles, Calif.
NORDBERG MFG.
3073 S. Chase Ave.
Milwaukee 1, Wisconsin
D. W. ONAN & SONS, INC.
University Avenue S. E. at 25th
Minneapolis 14, Minnesota
JOHN REINER & CO.
12-12 37th Ave.
Long Island City 3, N. Y.
A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.
R. H. SHEPPARD CO., INC.
201 Middle Street
Hanover, Pennsylvania
STERLING ENGINE CO.
1270 Niagara Street
Buffalo 13, N. Y.
WITTE ENGINE WORKS
Oil Well Supply Div.
United States Steel Corp.
1600 Oakland Ave.
Kansas City, Missouri

Diesel Industrial Tractors

R. H. SHEPPARD CO., INC.
201 Middle Street
Hanover, Pennsylvania

Diesel Locomotives

See also headings under "Locomotives".

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS CORP.
La Grange, Illinois

Diesel Locomotives, Elec. & Mech. Drives

AMERICAN LOCOMOTIVE CO.
Schenectady, New York
FAIRBANKS MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois
STERLING ENGINE CO.
1270 Niagara Street
Buffalo 13, New York

Diesel Maintenance Tools

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

Diesel Marine Engines

A. G. SCHOONMAKER CO. INC.
50 Church Street
New York 7, New York

Diesel Nozzle Testers

See also "Nozzle Testers".

AUTOMOTIVE PRODUCTS, INC.
1700 S. E. Grand Avenue
Portland 14, Oregon
BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.
THE BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois
C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Ave.
Cleveland 7, Ohio
CUMMINS ENGINE COMPANY, INC.
Columbus, Indiana
KENT MOORE ORGANIZATION INC.
5-105 General Motors Building
Detroit, Michigan
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Avenue
Franklin Park, Illinois

Diesel Power Units

ANDERSON-O'BRIEN COMPANY
746 East Washington Blvd.
Los Angeles 21, Calif.
BALDWIN-LIMA-HAMILTON CORP.
545 N. 3rd Street
Hamilton, Ohio
BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois
BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.
FAIRBANKS MORSE & CO.
600 South Michigan Ave.
Chicago 5, Illinois
HERCULES MOTOR CORP.
11th & Market S. E.
Canton 2, Ohio
INGERSOLL-RAND COMPANY
11 Broadway
New York 4, New York
NORDBERG MFG.
3073 S. Chase Ave.
Milwaukee 1, Wisconsin
A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, N. Y.
R. H. SHEPPARD CO., INC.
201 Middle Street
Hanover, Pennsylvania
STERLING ENGINE CO.
1270 Niagara Street
Buffalo 13, New York
WITTE ENGINE WORKS
Oil Well Supply Div.
United States Steel Corp.
1600 Oakland Ave.
Kansas City, Missouri

Diesel Pumping Units

BURMEISTER & WAIN AMERICAN CORPORATION
17 Battery Place
New York 4, New York
ENTERPRISE ENGINE & MACH. CO.
18th & Florida Streets
San Francisco 10, California
FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois
INGERSOLL-RAND COMPANY
11 Broadway
New York 4, New York
NORDBERG MFG. CO.
3073 So. Chase Ave.
Milwaukee 7, Wisconsin
JOHN REINER & CO.
12-12 37th Ave.
Long Island City 3, N. Y.
R. H. SHEPPARD CO., INC.
201 Middle Street
Hanover, Pennsylvania

Diesel Railway Generating Sets

AMERICAN LOCOMOTIVE CO.
Schenectady, New York
BALDWIN-LIMA-HAMILTON CORP.
545 N. 3rd Street
Hamilton, Ohio

NORDBERG MFG.
3073 S. Chase Ave.
Milwaukee 1, Wisconsin

STERLING ENGINE CO.
1270 Niagara Street
Buffalo 13, New York

WITTE ENGINE WORKS
OIL WELL SUPPLY DIV.
UNITED STATES STEEL CORP.
1600 Oakland Avenue
Kansas City, Missouri

Diesel Schools

UTILITIES ENGINEERING INSTITUTE
DIESEL DIVISION
2521 Sheffield Avenue
Chicago 14, Ill.

Diesel Testing Equipment

AUTOMOTIVE PRODUCTS, INC.
1700 Southeast Grand Ave.
Portland 14, Oregon

BACHARACH INDUSTRIAL
INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Penna.

DIESEL PLANT SPECIALTIES CO.
424 Portage Avenue
Stevens Point, Wisconsin

Drills, Portable Electric

SNAP-ON TOOLS CORP.
Kenosha, Wisconsin

Drives, Chain

DIAMOND CHAIN COMPANY, INC.
445 Kentucky Ave.
Indianapolis 7, Indiana

LINK-BELT CO.
220 South Belmont Ave.
Indianapolis 6, Indiana

MORSE CHAIN CO.
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Mich.

Drives, Gear

BRAD FOOTE GEAR WORKS, INC.
1315 South Cicero Ave.
Cicero 50, Illinois

Dynamometers and Prony Brakes

EATON MANUFACTURING COMPANY
740 East 140th Street
Cleveland 10, Ohio

Emergency Diesel Generators

See also "Auxiliary Diesel Generator Sets"; "Diesel Generating Sets"; "Emergency Lighting Plants"; "Packaged Generators".

AMERICAN LOCOMOTIVE CO.
Schenectady, New York

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd Street
Hamilton, Ohio

BURMEISTER & WAIN AMERICAN
CORPORATION
17 Battery Place
New York 4, New York

CONSOLIDATED DIESEL ELECTRIC
CORP.
(Box 1353) Canal & Ludlow Sts.
Stamford, Conn.

CUMMINS ENGINE COMPANY, INC.
Columbus, Indiana

DETROIT DIESEL ENGINE DIV.
GENERAL MOTORS CORP.
13400 W. Outer Drive
Detroit 28, Mich.

FAIRBANKS MORSE & CO.
600 South Michigan Ave.
Chicago 5, Illinois

HALLETT MANUFACTURING COMPANY
1601 West Florence Avenue
Inglewood, California

P & H DIESEL ENGINE DIVISION
HARNISCHFEGER CORPORATION
500 So. Main St.
Crystal Lake, Illinois

NATIONAL METAL & STEEL CORP.
DIESEL DIVISION
Dept. P. 1251 New Dock Street
Terminal Island Station
Los Angeles, Calif.

NORDBERG MFG.
3073 S. Chase Ave.
Milwaukee 1, Wisconsin

D. W. ONAN & SONS, INC.
University Ave. S. E. at 25th St.
Minneapolis 14, Minnesota

JOHN REINER & CO.
12-12 37th Ave.
Long Island City 3, N. Y.

R. H. SHEPPARD CO. INC.
201 Middle Street
Hanover, Pennsylvania

Emergency Lighting Plants

See also heading above.

BALDWIN-LIMA-HAMILTON
CORPORATION
545 North 3rd Street
Hamilton, Ohio

CONSOLIDATED DIESEL ELECTRIC
CORP.
(Box 1353) Canal & Ludlow Sts.
Stamford, Conn.

CUMMINS ENGINE COMPANY, INC.
Columbus, Indiana

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS CORPORATION
13400 West Outer Drive
Detroit 28, Michigan

NORDBERG MFG.
3073 S. Chase Ave.
Milwaukee 1, Wisconsin

D. W. ONAN & SONS, INC.
University Avenue S. E. at 25th
Minneapolis 14, Minnesota

JOHN REINER & CO.
12-12 37th Ave.
Long Island City 3, N. Y.

WITTE ENGINE WORKS
OIL WELL SUPPLY DIV.
UNITED STATES STEEL CORP.
1600 Oakland Ave.
Kansas City, Missouri

Enclosed Gear Drives

BRAD FOOTE GEAR WORKS, INC.
1315 South Cicero Ave.
Cicero 50, Illinois

Engine Repair Stands

BACHARACH INDUSTRIAL INSTRUMENT
CO.
7000 Bennett Street
Pittsburgh 8, Pa.

KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Bldg.
Detroit 2, Michigan

Engineering Service, Diesel Engine

LANOVA CORPORATION
38-15 30th Street
Long Island City 1, New York

Engines, Diesel, Used

NATIONAL METAL & STEEL CORP.
DIESEL DIVISION
Dept. P. 1251 New Dock St.
Terminal Island Station
Los Angeles, Calif.

A. G. SCHOONMAKER COMPANY, INC.
50 Church Street
New York 7, New York

Evaporators

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

MAXIM SILENCER CO.
85 Homestead Avenue
Hartford 5, Conn.

Evaporators, Exhaust Gas

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

Evaporators, Steam

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Exchangers, Heat

See also "Water Cooling Equipment" and headings under "Coolers" and "Heat Exchangers".

AEROFIN CORP.
410 S. Geddes St.
Syracuse 1, N. Y.

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

HARRISON RADIATOR DIVISION
GENERAL MOTORS CORP.
Washburn Street
Lockport, New York

KEWANEE-ROSS
ROSS HEATER DIVISION
1405 West Avenue
Buffalo 13, New York

J. F. PRITCHARD & COMPANY
210 West 10 Street
Kansas City 5, Missouri

Exchangers, Heat, Materials for Cleaning

See also headings under "Cleaner"; "Cooler"; "Cooling"; and "Engine"

OAKITE PRODUCTS, INC.
22 C Rector Street
New York 6, N. Y.

Exhaust Flexible Hose

See also headings under "Flexible"; "Hose"; and "Tubing"

DIESEL PLANT SPECIALTIES CO.
424 Portage Street
Stevens Point, Wisconsin

Expansion Joints, Corrugated, Stainless Steel

FLEXONICS CORP.
1363 S. Third Ave.
Maywood, Illinois

Fans, Axial Flow

SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Fans, Centrifugal

SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Fans, Radiator Cooling

KOPPERS COMPANY, INC.
METAL PRODUCTS DIVISION
P.O. Box 298
Baltimore 3, Maryland

SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Indiana

Farm Implements

R. H. SHEPPARD CO., INC.
201 Middle Street
Hanover, Pennsylvania

Filtering Systems

See headings under "Filters"

ENGINE LIFE PRODUCTS CORP.
115 South Granada Ave.
El Monte, California

PUROLATOR PRODUCTS INC.
970 New Brunswick Avenue
Rahway, New Jersey

U.S. HOFFMAN MACHINERY CORP.
INDUSTRIAL FILTRATION DIV.
219 Lamson St.
Syracuse, New York

WARNER LEWIS COMPANY
P.O. Box 3076
Tulsa, Oklahoma

Filters, Air

See also "Air Cleaners"; "Air Filters"; and Headings under "Breathers".

AIR MAZE CORPORATION
25000 Miles Road
Cleveland, Ohio

AMERICAN AIR FILTER COMPANY, INC.
Central Avenue
Louisville 8, Kentucky

CONTINENTAL AIR FILTERS, INC.
P. O. Box 1647
Louisville 1, Kentucky

CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Conn.

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York

Filters, Air, Automatic Self-Cleaned

AMERICAN AIR FILTER CO., INC.
Central Avenue
Louisville 8, Ky.

CONTINENTAL AIR FILTERS, INC.
P. O. Box 1647
Louisville 1, Kentucky

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York

Filters, Air, Dry Type

AMERICAN AIR FILTER CO., INC.
Central Avenue
Louisville 8, Ky.

CONTINENTAL AIR FILTERS, INC.
P. O. Box 1647
Louisville, 1, Ky.

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York

Filters, Air, Dry Type (Crankcase)

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York

FRAM CORP.
Providence 16, Rhode Island

Filters, Air, Oil Bath Type

AIR MAZE CORP.
25000 Miles Road
Cleveland 5, Ohio

AMERICAN AIR FILTER CO., INC.
Central Avenue
Louisville 8, Ky.

Filters, Air, Open-Screen Type

AIR MAZE CORP.
25000 Miles Road
Cleveland 5, Ohio

CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Conn.

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York

Filters, Air, Panel Type

AMERICAN AIR FILTER CO., INC.
Central Avenue
Louisville 8, Ky.

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York

Filters, (Centrifugal) Lube Oil

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York

THE SHARPLES CORPORATION
2300 Westmoreland Street
Philadelphia, Penna.

Filters, Compressed Air

AMERICAN AIR FILTER CO., INC.
Central Avenue
Louisville 8, Kentucky

BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.

COMMERCIAL FILTERS CORP.
2 Main Street
Melrose 76, Massachusetts

CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Connecticut

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York

WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Filters, Cooling

PERRY DIVISION OF
RM HOLLINGSHEAD CORPORATION
840 Cooper St.
Camden, New Jersey

Filters, 5-Micron, Diesel Fuel

BRIGGS FILTRATION CO.
River Road
Washington 16, D. C.

C. A. V. DIVISION OF LUCAS
ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio

COMMERCIAL FILTERS CORPORATION
2 Main St.
Melrose 76, Massachusetts

HONAN-CRANE CORPORATION
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana

WM. W. NUGENT & COMPANY, INC.
410-412 North Hermitage Avenue
Chicago 22, Illinois

PUROLATOR PRODUCTS, INC.
970 New Brunswick Avenue
Rahway, New Jersey

WINSLOW ENGINEERING CO.
4069 Hollis Street
Oakland 8, California

Filters, Fuel Oil

See also "Oil Filters".

AIR MAZE CORPORATION
25000 Miles Road
Cleveland, Ohio

AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.

BOWSER, INC.
Fort Wayne 2, Indiana

BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.

C. A. V., DIVISION OF LUCAS
ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio

COMMERCIAL FILTERS CORP.
2 Main Street
Melrose 76, Massachusetts

CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Conn.

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York

ENGINE LIFE PRODUCTS, CORP.
115 South Granada Avenue
El Monte, California

FRAM CORP.
Providence 16, Rhode Island

THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.

HONAN-CRANE CORPORATION
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Ave.
Lebanon, Indiana

LUBER-FINER, INC.
2514 South Grand Avenue
Los Angeles, California

WILLIAM W. NUGENT & CO., INC.
410 No. Hermitage Ave.
Chicago 22, Ill.

PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, N. J.

U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
219 Lamson Street
Syracuse 6, N. Y.

WARNER LEWIS COMPANY
P.O. Box 3096
Tulsa, Oklahoma

WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

Filters, Gasoline

BOWSER, INCORPORATED
Fort Wayne, Indiana

COMMERCIAL FILTERS CORP.
2 Main Street
Melrose 76, Massachusetts

CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Connecticut

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York

FRAM CORP.
Providence 16, R. I.

WM. W. NUGENT & COMPANY, INC.
410-412 North Hermitage Avenue
Chicago 22, Illinois

U. S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
219 Lamson Street
Syracuse 6, New York

WINSLOW ENGINEERING CO.
4069 Hollis Street
Oakland 8, California

Filters, Lubricating Oil

See also "Oil Filters".

AIR MAZE CORP.
25000 Miles Road
Cleveland 5, Ohio

BOWSER, INC.
Fort Wayne 2, Indiana

BRIGGS FILTRATION COMPANY
River Road
Washington 16, D. C.

COMMERCIAL FILTERS CORP.
2 Main Street
Melrose 76, Mass.

CUNO ENGINEERING CORP.
80 South Vine Street
Meriden, Conn.

DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin

ENGINE LIFE PRODUCTS CORP.
115 South Granada Avenue
El Monte, California

FRAM CORP.
Providence 16, Rhode Island

THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.

HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana

LUBER-FINER, INC.
2514 South Grand Avenue
Los Angeles, California

WILLIAM W. NUGENT & CO., INC.
410 N. Hermitage Ave.
Chicago 22, Ill.

PUROLATOR PRODUCTS, INC.
970 New Brunswick Ave.
Rahway, N. J.

WARNER LEWIS COMPANY
P.O. Box 3096
Tulsa, Oklahoma

WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

Filters, Lubricating Oil, Magnetic

HONAN-CRANE CORPORATION
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana

STAPLES & PFEIFFER
528 Bryant Street
San Francisco 17, California

U.S. HOFFMAN MACHINERY CORP.
FILTRATION DIVISION
219 Lamson Street
Syracuse 6, New York

WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

Filters, Panel Type

AMERICAN AIR FILTER COMPANY, INC.
Central Avenue
Louisville 8, Kentucky

WM. W. NUGENT & COMPANY, INC.
410-412 North Hermitage Avenue
Chicago 22, Illinois

Filter, Silencer Dry Type

DOLLINGER CORPORATION
11 Centre Park
Rochester 3, New York

Filters System

PERRY DIVISION
R. M. HOLLINGSHEAD CORP.
840 Cooper Street
Camden, New Jersey

Filters, Water

PERRY DIVISION
R. M. HOLLINGSHEAD CORP.
840 Cooper Street
Camden, New Jersey

Fire Extinguishers & Systems

WALTER KIDDE & CO., INC.
573 Main Street
Belleville, New Jersey

Fire Pump Controls

UNIVERSAL AUTOMATIC ENGINE CONTROLLER
53 West Jackson Blvd.
Chicago 4, Illinois

Fittings, Hose, Detachable

AEROQUIP CORPORATION
300 South East Avenue
Jackson, Michigan

STRATOFLEX, INCORPORATED
5255 River Oaks Blvd.
Fort Worth, Texas

THE WEATHERHEAD COMPANY
300 East 131 Street
Cleveland 8, Ohio

Fittings, Tube

THE WEATHERHEAD COMPANY
300 East 131 Street
Cleveland 8, Ohio

Flexible Connections, Stainless Steel

See also headings under "Hose" and "Tubing"

ATLANTIC METAL HOSE CO. INC.
309 Dyckman Street
New York 34, New York

FLEXONICS CORPORATION
1363 South Third Avenue
Maywood, Illinois

Flexible Exhaust Connections

See also headings under "Hose" and "Tubing"

ATLANTIC METAL HOSE CO., INC.
309 Dyckman Street
New York 34, New York

FLEXONICS CORP.
1363 South Third Avenue
Maywood, Ill.

Flexible Metal Hose

See also "Hose, Flexible, Metallic".

AEROQUIP CORPORATION
300 South East Avenue
Jackson, Michigan

ALLIED METAL HOSE COMPANY
37-46 Ninth Street
Long Island City 1, New York

AMERICAN BRASS COMPANY
AMERICAN METAL HOSE BRANCH
698 South Main Street
Waterbury 20, Connecticut

ATLANTIC METAL HOSE CO., INC.
309 Dyckman Street
New York 34, New York

FLEXONICS CORPORATION
1363 South Third Street
Maywood, Illinois

HALLET MFG. COMPANY
1601 W. Florence Avenue
Inglewood, California

STRATOFLEX, INCORPORATED
5255 River Oaks Blvd.
Fort Worth, Texas

Flexible Metal Hose, Fuel Oil, Lubricating Oil, Compressed Air

AEROQUIP CORPORATION
300 South East Avenue
Jackson, Michigan

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
698 South Main Street
Waterbury 20, Conn.

ATLANTIC METAL HOSE CO., INC.
309 Dyckman Street
New York 34, New York

STRATOFLEX, INCORPORATED
5255 River Oaks Blvd.
Fort Worth, Texas

Flexible Metal Hose, Fuel Oil, Lubricating Oil, Compressed Air & Water Lines

See also headings under "Hose" and "Tubing".

AEROQUIP CORPORATION
300 South East Avenue
Jackson, Michigan

ALLIED METAL HOSE COMPANY
37-46 Ninth Street
Long Island City 1, New York

THE AMERICAN BRASS COMPANY
AMERICAN METAL HOSE BRANCH
698 South Main Street
Waterbury 20, Conn.

ATLANTIC METAL HOSE CO., INC.
309 Dyckman Street
New York 34, New York

FLEXONICS CORPORATION
1363 South Third Avenue
Maywood, Illinois

STRATOFLEX, INCORPORATED
5255 River Oaks Blvd.
Fort Worth, Texas

Forgings, Aluminum

WYMAN-GORDON COMPANY
105 Madison Street
Worcester 1, Mass.

Forgings, Drop

TITUSVILLE FORGE DIVISION
STRUTHERS WELLS CORPORATION
Titusville, Pennsylvania

WYMAN-GORDON COMPANY
105 Madison Street
Worcester 1, Mass.

Forgings, Steel Carbon & Alloy

ERIE, FORGE & STEEL CORPORATION
15th & Cascade Streets
Erie, Pennsylvania

Forgings, Steel & Iron

ELLWOOD CITY FORGE CO.
Ellwood City, Pa.

TITUSVILLE FORGE DIVISION
STRUTHERS WELLS CORPORATION
Titusville, Pennsylvania

WYMAN-GORDON COMPANY
105 Madison Street
Worcester 1, Mass.

Fuel Injection Systems, Repair & Service

See also "Injection Systems, Service"; "Service, Injection System".

G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts

GERHARDT'S DIESEL FUEL INJECTION SERVICE
2501 Jefferson Highway
New Orleans, La.

INTERSTATE DIESEL SERVICE, INC.
7120 Carnegie Avenue
Cleveland 3, Ohio

Fuel Oil Additives

See also "Additives"; "Fuel Oil Treatment"

DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin

MAXFAL CHEMICAL CO.
33 West 42nd Street
New York, New York

WYNN OIL COMPANY
1151 West 5 Street
Azusa, California

Fuel Oil, Diesel

See also "Automotive Diesel Fuel"; "Oils, Diesel Fuels"; "Diesel Fuel Oil".

ASHLAND OIL & REFINING CO.
Ashland, Kentucky

CITIES SERVICE OIL CO.
70 Pine Street
New York 5, N. Y.

GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Building
Pittsburgh 30, Pa.

MID-CONTINENT PETROLEUM CORP.
Tulsa 2, Okla.

THE PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois

STANDARD OIL CO. (Indiana)
910 South Michigan Ave.
Chicago 80, Illinois

THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

Fuel Oil Heaters, Diesel

KEWANEE-ROSS CORP.
ROSS HEATER DIVISION
1405 West Avenue
Buffalo 13, New York

Fuel Oil Tar & Carbon Dispersing Agent

MAXFAL CHEMICAL CO.
33 West 42nd Street
New York, New York

Gages, Air Pressure

ROCHESTER MFG. CO., INC.
34 Rockwood Street
Rochester 10, New York

Gages, Draft, Portable Indicating

BACHARACH INDUSTRIAL INSTRUMENT CO.
7301 Penn Avenue
Pittsburgh 8, Pa.

Gages, Fuel

THE LIQUIDOMETER CORP.
36-24 Skillman Avenue
Long Island City 1, N. Y.

Gages, Liquid Level

ROCHESTER MFG. CO., INC.
34 Rockwood Street
Rochester 10, New York

Gages, Oil Pressure

ROCHESTER MFG. CO., INC.
34 Rockwood Street
Rochester 10, New York

Gages, Oil Viscosity

VISCO-METER CORPORATION
315 Grote Street
Buffalo 7, New York

Gages, Tank Contents

DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin
THE LIQUIDOMETER CORP.
36-24 Skillman Avenue
Long Island City 1, N. Y.
ROCHESTER MFG. CO., INC.
34 Rockwood Street
Rochester 10, New York

Gages, Tank Control

VIKING PUMP CO.
Fourth & Jorgensen Streets
Cedar Falls, Iowa

Gages, Temperature

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.
ILLINOIS TESTING LABORATORIES, INC.
420 North LaSalle Street
Chicago 10, Illinois
ROCHESTER MFG. CO., INC.
34 Rockwood Street
Rochester 10, New York

Gages, Vacuum

ROCHESTER MFG. CO., INC.
34 Rockwood Street
Rochester 10, New York

Gaskets

THE ANCHOR PACKING CO.
401 North Broad St.
Philadelphia 8, Pa.
THE FITZGERALD MFG. CO.
Torrington, Conn.

Gaskets, Asbestos

THE ANCHOR PACKING CO.
401 North Broad St.
Philadelphia 8, Pa.
THE FITZGERALD MFG. CO.
Torrington, Conn.
McCORD CORPORATION
Riopelle at Egrand Blvd.
Detroit 11, Michigan
VICTOR MFG. & GASKET CO.
57-50 Roosevelt Ave.
Chicago, Illinois

Gaskets, Cork

THE ANCHOR PACKING CO.
401 North Broad St.
Philadelphia 8, Pa.
THE FITZGERALD MFG. CO.
Torrington, Conn.

Gaskets, Fibrous

THE ANCHOR PACKING CO.
401 North Broad St.
Philadelphia 8, Pa.
THE FITZGERALD MFG. CO.
Torrington, Conn.

Gaskets, Metallic

THE ANCHOR PACKING CO.
401 North Broad St.
Philadelphia 8, Pa.
THE FITZGERALD MFG. CO.
Torrington, Conn.
McCORD CORPORATION
Riopelle at Egrand Blvd.
Detroit 11, Michigan
VICTOR MFG. & GASKET CO.
57-50 Roosevelt Ave.
Chicago, Illinois

Gaskets, Oil and Water

THE ANCHOR PACKING CO.
401 North Broad St.
Philadelphia 8, Pa.
THE FITZGERALD MFG. CO.
Torrington, Conn.
VICTOR MFG. & GASKET CO.
57-50 Roosevelt Ave.
Chicago, Illinois

Gear Lubricants

TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York, New York

Geared Transmissions, Auxiliary

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Geared Transmissions, Unit

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Gearmotors

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois
ELLIOTT COMPANY
Jeannette, Pennsylvania

Gears

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Gears, Aircraft Quality

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Gears, Bevel

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Gears, Cut

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Gears, Heat Treated

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Gears, Helical

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Gears, Herringbone

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Gears, Hypoid

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Gears, Internal

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Gears, Non-Metallic

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Gears, Planetary

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Gears, Reduction

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois
ROCKFORD CLUTCH DIVISION BORG-WARNER CORP.
1301 18th Avenue
Rockford, Illinois
THE SNOW-NABSTEDT GEAR CORP.
351 Welton Street
Hamden, Conn.

Gears, Speed Increaser

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Gears, Speed Reduction

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Gears, Spiral

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Gears, Spiral-Bevel

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Gears, Spur

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Gears, Worm

BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Geneerating Sets, Electric

See also "Diesel Generator Sets"; "Auxiliary Diesel Generating Sets"; "Emergency Diesel Generators"; "Emergency Lighting Plants"; "Packaged Generators"

BALDWIN-LIMA-HAMILTON
545 North Third Street
Hamilton, Ohio

THE BUDA COMPANY
154th & Commercial Avenues
Harvey, Illinois
BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, New York
CHICAGO PNEUMATIC TOOL CO.
6 East 44th Street
New York, New York
DIESEL DIVISION
NATIONAL METAL & STEEL COMPANY
Dept. P. 1251 New Dock Street
Terminal Island Station
FAIRBANKS MORSE & COMPANY
600 South Michigan Avenue
Chicago 5, Illinois
HALLET MFG. COMPANY
1601 W. Florence Avenue
Inglewood, California
THE IDEAL ELECTRIC & MFG. CO.
Mansfield, Ohio
NORDBERG MFG. CO.
3073 South Chase Avenue
Milwaukee, Wisconsin
D. W. ONAN & SONS, INC.
University Ave., S.E. at 25th
Minneapolis 14, Minnesota
RELIANCE ELECTRIC & ENGINEERING CO.
1088 Ivanhoe Road
Cleveland, Ohio
A. G. SCHOONMAKER COMPANY, INC.
50 Church Street
New York, New York

Generators, A. C.

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio
DELCO PRODUCTS DIVISION
GENERAL MOTORS CORP.
329 E. First St.
Dayton 9, Ohio
ELECTRIC MACHINERY MFG. CO.
800 Central Avenue
Minneapolis 13, Minn.
ELLIOTT COMPANY
Jeannette, Pennsylvania
HALLET MFG. COMPANY
1601 W. Florence Avenue
Inglewood, California
THE IDEAL ELECTRIC & MFG. CO.
Mansfield, Ohio
RELIANCE ELECTRIC & ENGINEERING CO.
1088 Ivanhoe Road
Cleveland, Ohio
A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, New York

Generators, Charging

AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Massachusetts
HALLET MFG. COMPANY
1601 W. Florence Street
Inglewood, California
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Generators, Charging, Direct Current Rectified A. C.

DELCO-REMY DIVISION
GENERAL MOTORS CORPORATION
2401 Columbus Avenue
Anderson, Indiana
HALLET MFG. COMPANY
1601 W. Florence Street
Inglewood, California
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Generators, D. C.

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Avenue
Cleveland 14, Ohio
DELCO PRODUCTS DIVISION
GENERAL MOTORS CORPORATION
329 E. First Street
Dayton 9, Ohio
DELCO-REMY DIVISION
GENERAL MOTORS CORPORATION
2401 Columbus Avenue
Anderson, Indiana
THE ELLIOTT COMPANY
Jeannette, Pennsylvania
HALLET MFG. COMPANY
1601 W. Florence Avenue
Inglewood, California
THE IDEAL ELECTRIC & MFG. CO.
Mansfield, Ohio
RELIANCE ELECTRIC & ENGINEERING CO.
1088 Ivanhoe Road
Cleveland 10, Ohio
A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, New York

Generators, Engine Driven

CLEVELAND DIESEL ENGINE DIVISION
GENERAL MOTORS CORPORATION
2160 West 106th Street
Cleveland 11, Ohio
CONSOLIDATED DIESEL ELECTRIC CORP.
(Box 1353) Canal & Ludlow Streets
Stamford, Connecticut
DELCO PRODUCTS DIVN.
GENERAL MOTORS CORPORATION
329 E. First Street
Dayton 9, Ohio
ELECTRIC MACHINERY MFG. CO.
800 Central Avenue
Minneapolis 13, Minn.
HALLET MFG. COMPANY
1601 W. Florence Street
Inglewood, California
D. W. ONAN & SONS, INC.
University Ave., S.E. at 25th
Minneapolis 14, Minnesota
JOHN REINER & COMPANY
12-12 37th Avenue
Long Island City 3, New York
A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, New York
WITTE ENGINE WORKS
OIL WELL SUPPLY DIVISION
UNITED STATES STEEL CORPORATION
1600 Oakland Avenue
Kansas City, Missouri

Governors, Centrifugal

FARRIS PICKERING GOVERNOR CO.
400 Commercial Avenue
Palisades Park, New Jersey
PIERCE GOVERNOR COMPANY
1625 Ohio Avenue
Anderson, Indiana
WOODWARD GOVERNOR COMPANY
5001 North Second Street
Rockford, Illinois

Governors, Hydraulic

FARRIS PICKERING GOVERNOR CO.
400 Commercial Avenue
Palisades Park, New Jersey
G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts
GERHARDT'S DIESEL FUEL INJECTION SERVICE
2501 Jefferson Highway
New Orleans, La.
WOODWARD GOVERNOR CO.
5001 N. Second St.
Rockford, Illinois

Governors, Overspeed

FARRIS PICKERING GOVERNOR CO.
400 Commercial Avenue
Palisades Park, New Jersey
PIERCE GOVERNOR COMPANY
1625 Ohio Avenue
Anderson, Indiana
SYNCHRO-START PRODUCTS, INC.
8151 North Ridgeway Avenue
Skokie, Illinois
WOODWARD GOVERNOR CO.
5001 N. Second St.
Rockford, Illinois

Governors, Overspeed, Engine Shut-Off

FARRIS PICKERING GOVERNOR CO.
400 Commercial Avenue
Palisades Park, New Jersey
PIERCE GOVERNOR CO.
1625 Ohio Ave.
Anderson, Indiana
SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Ave.
Skokie, Ill.

Graphite, Wheel Flange Lubrication Rods

NATIONAL CARBON COMPANY
DIVISION OF UNION CARBIDE & CARBON CORP.
30 E. 42 Street
New York, New York

Greases

See also "Lubricants"; "Automotive Greases".

CITIES SERVICE OIL CO.
70 Pine Street
New York, N. Y.
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, New York
STANDARD OIL COMPANY OF CALIF.
225 Bush Street
San Francisco 20, California
THE TEXAS COMPANY
135 E. 42d St.
New York 17, N. Y.

Greases, Automotive

MID-CONTINENT PETROLEUM CORP.
Box 381
Tulsa 2, Oklahoma

Greases, Industrial

MID-CONTINENT PETROLEUM CORP.
Box 381
Tulsa 2, Oklahoma

Grey Iron and Steel Castings

EATON MANUFACTURING COMPANY
740 East 140th Street
Cleveland 10, Ohio

Grinders, Surface, Cylinder Head & Block

LEMPCO PRODUCTS
Dunham Road
Bedford, Ohio

Grinders Valve Seat

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pennsylvania

Gun Greases

TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York, New York

Heat Exchangers, Air Cooled

AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 4, N. Y.
AMERICAN LOCOMOTIVE CO.
Schenectady, New York
HARRISON RADIATOR DIVISION
GENERAL MOTORS CORP.
Washburn Street
Lockport 10, N. Y.
J. F. PRITCHARD & CO.
210 W. 10 St.
Kansas City 5, Missouri
THE FLUOR CORP., LTD.
2500 So. Atlantic Blvd.
Los Angeles 22, Calif.

Heat Exchangers, Cleaner

MAXFAL CHEMICAL CO.
33 West 42nd Street
New York, New York

Heat Exchangers, Industrial

AEROFIN CORPORATION
410 South Geddes Street
Syracuse 4, New York
AMERICAN LOCOMOTIVE CO.
Schenectady, New York
HARRISON RADIATOR DIVISION
GENERAL MOTORS CORPORATION
Washburn Street
Locport, New York

Heat Exchangers, Oil and Water

See also headings under "Coolers"; "Exchangers, Heat"; "Water Cooling Equipment"; etc.

AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 4, N. Y.
AMERICAN LOCOMOTIVE CO.
Schenectady, New York
HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, N. Y.
THE SIMS COMPANY
Erie, Pa.

Heat Treating Equipment, Induction

OHIO CRANKSHAFT COMPANY
3800 Harvard Ave.
Cleveland 5, Ohio

Heaters, Feed Water

AMERICAN LOCOMOTIVE CO.
Schenectady, N. Y.

Heavy Duty Lubricants

MID-CONTINENTAL PETROLEUM CORP.
Box 381
Tulsa 2, Oklahoma

High Temperature Grease

TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York, New York

Hose, Air Intake, Flexible Metallic

THE AMERICAN BRASS COMPANY
AMERICAN METAL HOSE BRANCH
698 South Main Street
Waterbury 20, Connecticut

Hose, Exhaust, Flexible Metallic

THE AMERICAN BRASS COMPANY
AMERICAN METAL HOSE BRANCH
698 South Main Street
Waterbury 20, Connecticut

Hose, Flexible, Stainless Steel

ALLIED METAL HOSE CO.
3746 Ninth Street
Long Island City 1, New York

Hose, Metal For Steam, Oil, Compressed Air

See also headings under "Flexible Hose" and "Tubing".

THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
698 S. Main Street
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
309 Dyckman Street
New York 34, New York
FLEXONICS CORPORATION
1363 South Third Avenue
Maywood, Illinois

Hoses & Hose Assemblies, Non-Metallic

AEROQUIP CORPORATION
300 South East Avenue
Jackson, Michigan
STRATOFLEX, INC.
5255 River Oaks, Blvd.
Fort Worth, Texas.
THE WEATHERHEAD COMPANY
300 East 131st Street
Cleveland 8, Ohio

Hoses & Hose Assemblies Non-Metallic

AEROQUIP CORPORATION
300 South East Avenue
Jackson, Michigan
THE AMERICAN BRASS COMPANY
AMERICAN METAL HOSE BRANCH
698 S. Main Street
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO. INC.
309 Dyckman Street
New York 34, N. Y.
FLEXONICS CORP.,
1363 South 3rd Ave.
Maywood, Illinois
STRATOFLEX, INC.
5255 River Oaks Blvd.
Fort Worth, Texas
THE WEATHERHEAD COMPANY
300 East 131st Street
Cleveland 8, Ohio

Hoses, Flexible Metallic

AEROQUIP CORPORATION
300 South East Avenue
Jackson, Michigan
ALLIED METAL HOSE CO.
37-46 Ninth Street
Long Island City 1, New York
THE AMERICAN BRASS CO.
AMERICAN METAL HOSE BRANCH
698 S. Main Street
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO. INC.
309 Dyckman Street
New York 34, N. Y.
FLEXONICS CORP.
1363 South 3rd Avenue
Maywood, Illinois
STRATOFLEX, INC.
5255 River Oaks, Blvd.
Fort Worth, Texas

Hoses, Flexible Wire Braid

AEROQUIP CORPORATION
300 South East Avenue
Jackson, Michigan
ATLANTIC METAL HOSE CO. INC.
309 Dyckman Street
New York 34, N. Y.
STRATOFLEX, INC.
5255 River Oaks Blvd.
Fort Worth, Texas
THE WEATHERHEAD COMPANY
300 East 131 Street
Cleveland 8, Ohio

Hydraulic Fluids

SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, New York

Hydraulic, Governors

See also "Governors, Hydraulic" and "Governors, Overspeed"

WOODWARD GOVERNOR CO.
5001 North 2nd Street
Rockford, Illinois

Hydraulic, Motors

PESCO PRODUCTS DIVISION
BORG-WARNER CORP.
24700 North Miles Road
Bedford, Ohio

Hydraulic Oils

TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York, New York

Hydraulic Test Pumps

KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Avenue
Franklin Park, Illinois

Ignition Systems, Gas Engine

AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield 7, Mass.
DELCO-REMY DIVISION
GENERAL MOTORS CORPORATION
2401 Columbus Avenue
Anderson, Indiana
SCINTILLA MAGNETO DIVISION
BENDIX AVIATION CORPORATION
Sidney, New York

Ignition Transformers

AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield 7, Mass.

Impact Wrenches

INGERSOLL-RAND COMPANY
11 Broadway
New York 4, New York
SNAP-ON TOOLS CORPORATION
Kenosha, Wisconsin

Indicator Valves

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Avenue
Franklin Park, Illinois

Indicators, Carbon Dioxide Portable

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

Indicators, Card Drawing Type

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

Indicators, Diesel Engine

See also "Compression Testers, Diesel Engine", and other headings under "Indicators".

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.
KIENE DIESEL ACCESSORIES, INC.
10352 Pacific Ave.
Franklin Park, Illinois

Indicators, Diesel Engine Pressure

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pa.

Indicators, Maximum Pressure
BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

Indicators, Oxygen, Portable
BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

Indicators, Pressure-Time, Diesel Engine
BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.
ELECTRO PRODUCTS LABORATORIES, INC.
4501 No. Ravenswood Ave.
Chicago 40, Illinois
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Indicators, Sight Flow
BOWSER, INC.
Fort Wayne 2, Indiana
WILLIAM W. NUGENT & CO.
410 N. Hermitage Ave.
Chicago 22, Ill.

Indicators, Speed
BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.
HERMAN H. STICHT COMPANY, INC.
27 Park Place
New York, New York

Indicators, Speed, Electric
WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Ave.
Newark, New Jersey

Induction Heating Equipment
OHIO CRANKSHAFT COMPANY
3800 Harvard Avenue
Cleveland 5, Ohio

Industrial Flashlights & Batteries
NATIONAL CARBON CO.
DIVISION OF UNION CARBIDE & CARBON CORP.
30 E. 42 Street
New York, New York

Industrial Oils
See also headings under "Lubricants" and "Greases".
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, New York
STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street
San Francisco 20, California

Industrial Wheel Tractors
R. H. SHEPPARD CO., INC.
201 Middle St.
Hanover, Pa.

Ingots and Billets
ERIE FORGE & STEEL CORPORATION
15th & Cascade Streets
Erie, Pennsylvania

Injection Calibration & Test Stands
G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts

Injection Systems, Fuel
AMERICAN BOSCH CORP.
3664 Main St.
Springfield 7, Mass.
C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts
GERHARDT'S DIESEL FUEL INJECTION SERVICE
2501 Jefferson Highway
New Orleans, La.
HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2, Conn.
SCINTILLA MAGNETO DIVN.
BENDIX AVIATION CORP.
Sidney, N. Y.
UNEX PRODUCTS CORP.
30 Vesey Street
New York 7, N. Y.

Injection Systems, Service
See also "Fuel Injection Systems, Repair & Service"; "Service, Injection System"
G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts
GERHARDT'S DIESEL FUEL INJECTION SERVICE
2501 Jefferson Highway
New Orleans, La.

Injection & Injector Pump Exchange
G & K DIESEL SERVICE
12 Atlantic Avene
Boston 10, Mass.

Injector and Pump Replacement Parts
G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts
UNEX PRODUCTS CORP.
30 Vesey Street
New York 7, N. Y.

Injector Test Stand
See also "Nozzle Testers"
AUTOMOTIVE PRODUCTS, INC.
1700 Southeast Grand Ave.
Portland 14, Oregon
BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Inspection, Manufacturer and Overhaul for Defects
TURCO PRODUCTS, INC.
6135 South Central Ave.
Los Angeles, Calif.

Intake Silencers—Cleaners, Dry Type
See also "Silencers, Intake".
BURGESS-MANNING COMPANY
749 East Park Avenue
Libertyville, Illinois

Laboratory, Diesel Engine
LANOVA CORP.
38-15 30th St.
Long Island City 1, N. Y.

Lapping Blocks
BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

Lifts, Portable Hydraulic
LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

Line Boring Machines
CEDAR RAPIDS ENGINEERING CO.
902 17th St., N.E.
Cedar Rapids, Iowa

Liner Plating, Porous Chrome
SPAR-TAN ENGINEERING COMPANY
Western Licensee—Van der Horst Corp.
2445 Enterprise St.
Los Angeles 21, California
VAN DER HORST CORP. OF AMERICA
Olean, New York

Liners, Diesel Cylinder
See also "Cylinder Liners."
HUNT-SPILLER MFG. CO.
383 Dorchester Ave.
Boston 27, Mass.

Locomotives, Diesel
See also "Diesel Locomotives"
AMERICAN LOCOMOTIVE CO.
Schenectady, New York
DAVENPORT BESLER CORP.
2305 Rockingham Road
Davenport, Iowa
FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois
PLYMOUTH LOCOMOTIVE WORKS
DIV. OF THE FATE-ROOT-HEATH CO.
Plymouth, Ohio

Locomotives, Diesel-Electric
AMERICAN LOCOMOTIVE CO.
Schenectady, New York
DAVENPORT BESLER CORP.
2305 Rockingham Road
Davenport, Iowa
PLYMOUTH LOCOMOTIVE WORKS
DIV. OF THE FATE-ROOT-HEATH CO.
Plymouth, Ohio

Locomotives, Diesel-Hydraulic
DAVENPORT BESLER CORP.
2305 Rockingham Road
Davenport, Iowa
PLYMOUTH LOCOMOTIVE WORKS
DIV. OF THE FATE-ROOT-HEATH CO.
Plymouth, Ohio

Locomotives, Diesel-Mechanical
DAVENPORT BESLER CORP.
2305 Rockingham Road
Davenport, Iowa
PLYMOUTH LOCOMOTIVE WORKS
DIV. of the FATE-ROT-HEATH CO.
Plymouth, Ohio

Locomotives, Diesel Mine
DAVENPORT BESLER CORP.
2305 Rockingham Road
Davenport, Iowa

Locomotives, Starting Batteries
See also heading under "Batteries, Storage" and "Starting Batteries, Storage"
SURRETTE STORAGE BATTERY CO., INC.
Jefferson Avenue
Salem, Mass.

Lubricants
See also "Industrial Oils", "Greases" and "Automotive Greases"
ASHLAND OIL & REFINING CO.
Ashland, Kentucky
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SINCLAIR REFINING COMPANY
600 Fifth Avenue
New York 20, N. Y.
THE TEXAS COMPANY
135 East 42 Street
New York 17, New York
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, New York

Lubricants, Diesel Engine
MID-CONTINENT PETROLEUM CORP.
Box 381
Tulsa 2, Oklahoma

Lubricating Compounds
THE ANCHOR PACKING CO.
401 N. Broad Street
Philadelphia 8, Pa.
CITIES SERVICE OIL COMPANY
70 Pine Street
New York, New York

Lubricating Oils
See also "Automotive Lubricating Oils"; "Oils Lubricating" and "Cylinder Oils".
ASHLAND OIL & REFINING CO.
Ashland, Kentucky
CITIES SERVICE OIL COMPANY
70 Pine Street
New York, New York
GULF OIL CORP.
GULF REFINING CO.
3702 Gulf Bldg.
Pittsburgh 30, Pa.
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
SINCLAIR REFINING CO.
600 Fifth Ave.
New York 20, N. Y.
STANDARD OIL CO. OF CALIFORNIA
225 Bush Street
San Francisco 20, Calif.
STANDARD OIL CO. (INDIANA)
910 South Michigan Ave.
Chicago, Illinois
TIDE WATER ASSOCIATED OIL CO.
17 Battery Place
New York 4, New York

Lubricating Oils, Industrial
MID-CONTINENT PETROLEUM CORP.
P. O. Box 381
Tulsa 2, Oklahoma

Lubrication Additives
WYNN OIL CO.
1151 West 5th Street
Azusa, Calif.

Lubricators, Force Feed
MADISON-KIPP CORPORATION
Madison 10, Wisconsin

Lubricators, Fresh Oil
MADISON-KIPP CORPORATION
Madison 10, Wisconsin

Lubricators, Mechanical
See also "Mechanical Force Feed Oil Systems".
MADISON-KIPP CORPORATION
Madison 10, Wisconsin
McCORD CORPORATION
Riopelle at Egrand Blvd.
Detroit 11, Michigan
MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.

Lubricators, Multiple Feed
MADISON-KIPP CORPORATION
Madison 10, Wisconsin

Lubricators, Sight Feed
MADISON-KIPP CORPORATION
Madison 10, Wisconsin

Machine Shop Products
LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

Machine Tools
BROWN & SHARPE MANUFACTURING CO.
Providence 1, Rhode Island
LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio
VAN NORMAN COMPANY
3640 Main Street
Springfield, Mass.

Machine Tools, Precision
BROWN & SHARPE MFG. CO.
235 Promenade Street
Providence 1, Rhode Island
VAN NORMAN COMPANY
3640 Main Street
Springfield, Mass.

Machine Tools, Precision Honing
VAN NORMAN COMPANY
3640 Main Street
Springfield, Mass.

Magniflux Inspection Service
CLEVELAND HONE & MFG. CO.
8816 Harkness Road
Cleveland 6, Ohio

Magnetic Disc Brakemotors
STAR-KIMBLE MOTOR DIVISION
MIEHLE PRINTING PRESS & MFG. CO.
200 Bloomfield Ave.
Bloomfield, New Jersey

Magnetos, High Tension
AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Mass.
SCINTILLA MAGNETO DIVISION
BENDIX AVIATION CORPORATION
Sidney, New York

Magnetos, Low Tension
AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Mass.
SCINTILLA MAGNETO DIVISION
BENDIX AVIATION CORPORATION
Sidney, New York

Manifolds
HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.

Marine Batteries
SURRETTE STORAGE BATTERY CO. INC.
Jefferson Avenue
Salem, Mass.

Marine Diesel, Front Gear-Driven Accessories
FAIRBANKS MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois

Marine Reduction Gears
BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Ave.
Cicero 50, Illinois

Marine Reverse & Reduction Gears
BRAD-FOOTE GEAR WORKS, INC.
1315 South Cicero Ave.
Cicero 50, Illinois
GRAY MARINE MOTOR COMPANY
710 Canton Avenue
Detroit 7, Michigan
THE SNOW-NABSTEDT GEAR CORP.
351 Welton Street
Hamden, Conn.

Melting Furnaces, Induction
OHIO CRANKSHAFT COMPANY
3800 Harvard Avenue
Cleveland, Ohio

Metal Spraying & Finishing
BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, N. Y.

Metallizing, Equipment
METALLIZING ENGINEERING CO.
38-18 30th Street
Long Island City 1, New York

Meter, Elapsed Time
BURLINGTON INSTRUMENT COMPANY
203 North 3rd Street
Burlington, Iowa

Meters, Electrical Indicating
See also "Ammeters"
BURLINGTON INSTRUMENT CO.
203 N. 3rd St.
Burlington, Iowa
WESTON ELECTRICAL INSTRUMENT CO.
614 Frelinghuysen Avenue
Newark 5, N. J.

Meters, Fuel Oil
BOWSER, INC.
Fort Wayne 2, Indiana
NEPTUNE METER COMPANY
50 West Street
New York 20, New York

Micrometers
BROWN & SHARPE MANUFACTURING COMPANY
Providence 1, Rhode Island
ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Illinois

Motor & Generator Brushes
NATIONAL CARBON COMPANY
DIVISION OF UNION CARBIDE & CARBON CORP.
30 East 42 Street
New York, New York

Motor Fuels
See also "Automotive Diesel Fuel"; "Diesel Fuel Oil"; "Fuel Oil, Diesel"; "Oil, Diesel Fuel".
CITIES SERVICE OIL CO.
70 Pine Street
New York, N. Y.
STANDARD OIL CO. OF CALIF.
225 Bush Street
San Francisco, California

Motor Generator Sets—Electro Plating, Low Voltage
COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Avenue
Cleveland 14, Ohio
CONSOLIDATED DIESEL ELECTRIC CORP.
(Box 1353) Canal & Ludlow Sts.
Stamford, Conn.
THE IDEAL ELECTRIC & MFG. CO.
Mansfield, Ohio

Motor Oils
MID-CONTINENT PETROLEUM CORP.
P. O. Box 381
Tulsa 2, Oklahoma

Motors, Electric, A. C.
ELECTRIC MACHINERY MFG. CO.
800 Central Avenue
Minneapolis 13, Minn.

Motors, Electric, A. C. & D. C.
DELCO PRODUCTS DIVISION
GENERAL MOTORS CORP.
329 East First Street
Dayton 9, Ohio
ELLIOTT COMPANY
Jeannette, Pennsylvania
THE IDEAL ELECTRIC & MFG. CO.
Mansfield, Ohio
PESCO PRODUCTS DIVISION
BORG-WARNER CORP.
24700 North Miles Road
Bedford, Ohio

RELIANCE ELECTRIC & ENGINEERING COMPANY
1088 Ivanhoe Road
Cleveland 10, Ohio
STAR-KIMBLE MOTOR DIVISION
MIEHLE PRINTING PRESS & MFG. CO.
200 Bloomfield Avenue
Bloomfield, New Jersey

Motors, Gear

BRAD FOOTE GEAR WORKS, INC.
1315 South Cicero Ave.
Cicero 50, Illinois
ELLIOTT COMPANY
Jeannette, Pennsylvania
RELIANCE ELECTRIC & ENGINEERING CO.
1088 Ivanhoe Road
Cleveland 10, Ohio

Mufflers, Intake & Exhaust

See also headings under "Silencers".
BURGESS-MANNING COMPANY
749 East Park Avenue
Libertyville, Illinois
DONALDSON COMPANY, INC.
666 Pelham Boulevard
St. Paul 4, Minnesota
KITTELL MUFFLER & ENGINEERING CO.
915 South Santa Fe Avenue
Los Angeles, California
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.
RIKER MANUFACTURING
4809 Detroit Ave.
Toledo, Ohio
THE FLUOR CORP., LTD.
2500 So. Atlantic Blvd.
Los Angeles 22, Calif.

Mufflers, Spark Arresting

BURGESS-MANNING COMPANY
749 East Park Avenue
Libertyville, Illinois
KITTELL MUFFLER & ENGINEERING CO.
915 South Santa Fe Avenue
Los Angeles, California
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Nozzle Cleaning Tools

BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7000 Bennett St.
Pittsburgh 8, Pa.

Nozzle Testers

See also "Injector Test Stand".
AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Massachuetts
BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7000 Bennett St.
Pittsburgh 8, Pa.
C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts

Nozzle Test Stands

BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7000 Bennett St.
Pittsburgh 8, Pa.

Nozzles, Spray, Water Cooled

AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.
SCINTILLA MAGNETO DIVISION
BENDIX AVIATION CORPORATION
Sidney, New York

Nozzles, Spray, Water Cooling

See also "Spray Nozzles, Water".
J. F. PRITCHARD & CO.
210 West 10th Street
Kansas City 5, Mo.

Oil Conditioners

See also headings under "Centrifuges"; "Conditioners".
BOWSER, INC.
Fort Wayne 2, Indiana
THE BRIGGS FILTRATION COMPANY
River Road
Washington 16, D.C.
THE HILLIARD CORP.
120 West 4th St.
Elmira, New York
WM. W. NUGENT & COMPANY, INC.
410-412 North Hermitage Avenue
Chicago 22, Illinois
U. S. HOFFMAN MACHINERY CORP.
Filtration Division
219 Lamson St.
Syracuse 6, New York
WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Oil Filters

See also "Filters"; "Lubricating Oils".
FRAM CORP.
Providence 16 R. I.
WARNER LEWIS COMPANY
P. O. Box 3096
Tulsa, Oklahoma

Oil Purification Systems, Filtering Earth Type

BOWSER, INC.
Fort Wayne 2
Indiana
THE BRIGGS FILTRATION COMPANY
River Road
Washington 16, D.C.
THE HILLIARD CORP.
120 W. Fourth St.
Elmira, N. Y.
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana
U. S. HOFFMAN CORP.
FILTRATION DIVISION
219 Lamson St.
Syracuse 6, New York

Oil Purification Systems Pressure and Gravity Types

BOWSER, INC.
Fort Wayne 2
Indiana
THE BRIGGS FILTRATION COMPANY
River Road
Washington 16, D.C.
WINSLOW ENGINEERING COMPANY
4069-73 Hollis Street
Oakland 8, California

Oil Reclamation Systems

CENTRICO, INC.
75 West Forest Ave.
Englewood, N. J.
DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York
THE HILLIARD CORPORATION
120 West Fourth Street
Elmira, New York
WM. W. NUGENT & COMPANY, INC.
410-412 North Hermitage Avenue
Chicago 22, Illinois
THE SHARPLES CORPORATION
2300 Westmoreland St.
Philadelphia, Pa.
U. S. HOFFMAN MACHINERY CORP.
Industrial Filtration Div.
219 Lamson St.
Syracuse, New York

Oil Seals & Grease Retainers

THE FITZGERALD MFG. CO.
Torrington, Conn.
VICTOR MFG. & GASKET CO.
57-50 Roosevelt Ave.
Chicago, Illinois

Oil Separators

AIR MAZE CORPORATION
25000 Miles Road
Cleveland, Ohio
CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey
THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie
New York
THE SHARPLES CORPORATION
2300 Westmoreland St.
Philadelphia, Pa.

Oil Systems, Pressure & Gravity Type

WM. W. NUGENT & COMPANY, INC.
410 North Hermitage Avenue
Chicago 22, Illinois

Oil Testing Equipment (Engine Room Kits)

THE GERIN CORP.
Avon, New Jersey

Oils, Diesel Fuel

See also "Automotive Diesel Fuel"; "Diesel Fuel Oil"; "Fuel Oil, Diesel"; "Motor Fuels".
ASHLAND OIL & REFINING CO.
Ashland, Kentucky
GULF OIL CORPORATION
GULF REFINING COMPANY
3702 Gulf Building
Pittsburgh 30, Pa.
PURE OIL COMPANY
35 East Wacker Drive
Chicago 1, Illinois
THE TEXAS COMPANY
135 East 42 Street
New York 17, New York

Packaged Generators

CHICAGO-PNEUMATIC TOOL CO.
6 East 44th St.
New York, New York

Packing, Lead, Shredded

THE ANCHOR PACKING CO.
401 N. Broad St.
Philadelphia 8, Pa.

Packing, Oil Wiper

THE ANCHOR PACKING CO.
401 N. Broad St.
Philadelphia 8, Pa.
C. LEE COOK MFG. CO.
916 South 8 St.
Louisville 3, Kentucky

Packing, Rod Metallic

THE ANCHOR PACKING CO.
401 N. Broad St.
Phladelphia 8, Pa.
C. LEE COOK MFG. CO.
916 South 8 St.
Louisville 3, Kentucky
DOUBLE SEAL RING COMPANY
2065 Montgomery Street
Fort Worth, Texas

Packing, Semi-Metallic

RAINS WOOD-METAL PACKINGS
904 W. Broadway
Spokane, Washington

Packing Sheets

THE ANCHOR PACKING CO.
401 N. Broad St.
Philadelphia 8, Pa.
FITZGERALD MANUFACTURING CO.
Torrington, Connecticut
VICTOR MFG. & GASKET CO.
57-50 Roosevelt Ave.
Chicago, Illinois

Packing, Sheets, Oil & Water

THE ANCHOR PACKING CO.
401 N. Broad St.
Philadelphia 8, Pa.
VICTOR MFG. & GASKET CO.
57-50 Roosevelt Ave.
Chicago, Illinois

Packing, Superheat

RAINS WOOD-METAL PACKINGS
904 W. Broadway
Spokane, Washington

Pinions

BRAD FOOTE GEAR WORKS, INC.
1315 South Cicero Ave.
Cicero 50, Illinois

Pipe Fittings, Compression

THE WEATHERHEAD COMPANY
300 East 131 Street
Cleveland 8, Ohio

Piping, Prefabricated

THE FLUOR CORP., LTD.
2500 So. Atlantic Blvd.
Los Angeles 22, Calif.

Piston Grinders

CEDAR RAPIDS ENGINEERING CO.
902 17th St. N.E.
Cedar Rapids, Iowa

Piston Pin Bushing Borer

VAN NORMAN COMPANY
3640 Main Street
Springfield, Massachusetts

Piston Pins

SEALED POWER CORPORATION
2001 Sanford St.
Muskegon 61, Michigan

Piston Ring Pot Castings

KOPPERS COMPANY, INC.
METAL PRODUCTS DIV.
200 Scott Street
Baltimore 3, Maryland

Piston Ring Removers

DOUBLE SEAL RING COMPANY
2065 Montgomery Street
Fort Worth, Texas

Piston Rings

C. LEE COOK MFG. CO.
916 South 8 St.
Louisville 3, Kentucky
DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin
DOUBLE SEAL RING COMPANY
2065 Montgomery Street
Fort Worth, Texas
HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.
KOPPERS CO., INC.
METAL PRODUCT DIVISION
P.O. Box 298
Baltimore 3, Maryland
SEALED POWER CORP.
2001 Sanford Street
Muskegon 61, Michigan
WILKENING MANUFACTURING CO.
2000 South 71 Street
Philadelphia 42, Pennsylvania

Piston Rings, Oil Control

C. LEE COOK MANUFACTURING CO.
916 South 8 St.
Louisville 3, Kentucky
DOUBLE SEAL RING COMPANY
2065 Montgomery Street
Fort Worth, Texas
KOPPERS COMPANY, INC.
METAL PRODUCTS DIV.
200 Scott Street
Baltimore 3, Maryland
SEALED POWER CORPORATION
2001 Sanford Street
Mukegon 61, Michigan
WILKENING MANUFACTURING CO.
2000 South 71 Street
Philadelphia 42, Pennsylvania

Piston Rings, Sealing

C. LEE COOK MFG. CO.
916 South 8 St.
Louisville 3, Kentucky
DOUBLE SEAL RING CO.
2065 Montgomery Street
Fort Worth, Texas
KOPPERS CO. INC.
METAL PRODUCTS DIVISION
P.O. Box 298
Baltimore 3, Maryland
SEALED POWER CORPORATION
2001 Sanford Street
Muskegon 61, Michigan
WILKENING MANUFACTURING CO.
2000 South 71 Street
Philadelphia 42, Pennsylvania

Pistons

THE OHIO PISTON COMPANY
5340 Hamilton Avenue
Cleveland 14, Ohio
SEALED POWER CORPORATION
2001 Sanford Street
Muskegon 61, Michigan
ZOLLNER MACHINE WORKS
Beuter Road
Fort Wayne, Indiana

Pistons, Aluminum Alloy

THE OHIO PISTON COMPANY
5340 Hamilton Avenue
Cleveland 14, Ohio
SEALED POWER CORP.
2001 Sanford Street
Muskegon 61, Michigan
ZOLLNER MACHINE WORKS
Beuter Road
Fort Wayne, Indiana

Pistons, Aluminum, Anodized Compression Ring Grooves, Tinned Oil Ring Groove and Skirt

ZOLLNER MACHINE WORKS
Beuter Road
Fort Wayne, Indiana

Pistons, Aluminum, Ni-Reset Top Ring Groove

ZOLLNER MACHINE WORKS
Beuter Road
Fort Wayne, Indiana

Pistons, Aluminum, Steel Tension Member

ZOLLNER MACHINE WORKS
Beuter Road
Fort Wayne, Indiana

Pistons, Cast Iron

HUNT-SPILLER MFG. CORP.
383 Dorchester Avenue
Boston 27, Mass.
THE OHIO PISTON COMPANY
5340 Hamilton Avenue
Cleveland 14, Ohio
SEALED POWER CORPORATION
2001 Sanford Street
Muskegon 61, Michigan

Pistons, Diesel Engine

ZOLLNER MACHINE WORKS
Beuter Road
Fort Wayne, Indiana

Pistons, Heavy Duty

ZOLLNER MACHINE WORKS
Beuter Road
Fort Wayne, Indiana

Plating, Chrome

KOPPERS COMPANY, INC.
METAL PRODUCTS DIV.
200 Scott Street
Baltimore 3, Maryland

Plating, Porous Chrome

SPAR-TAN ENGINEERING CO.
Western Licensee—Van Der Horst Corp.
2445 Enterprise St.
Los Angeles 21, Calif.
VAN DER HORST CORP. OF AMERICA
Olean, New York

Pneumatic Tools

CHICAGO PNEUMATIC TOOL CO.
6 East 44 Street
New York, New York

Poppet Valve Rebuilding

NATIONAL WELDING & GRINDING CO.
2929 Canton Street
Dallas 1, Texas

Portable Power Units

CONSOLIDATED DIESEL ELECTRIC CORP.
(Box 1353) Canal & Ludlow Sts.
Stanford,Conn.
CUMMINS ENGINE COMPANY, INC.
Columbus, Indiana
DIESEL DIVISION—NATIONAL METAL AND STEEL CORP.
Dept. P, 1251 New Dock Street
Terminal Island Station
Los Angeles, Calif.
FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois
NORDBERG MFG. CO.
3073 So. Chase Avenue
Milwaukee 1, Wisconsin
JOHN REINER & CO.
12-12 37th Avenue
Long Island City 3, N. Y.
A. G. SCHOONMAKER CO., INC.
50 Church Street
New York 7, New York

Power Plants, Automatically Controlled

FAIRBANKS, MORSE & CO.
600 So. Michigan Ave.
Chicago 5, Illinois
JOHN REINER & CO.
12-12 37th Avenue
Long Island City 3, N. Y.

Power Take-Off Units

NORDBERG MFG. CO.
3073 So. Chase Avenue
Milwaukee 1, Wisconsin
ROCKFORD CLUTCH DIVISION
BORG-WARNER CORPORATION
1301 18th Avenue
Rockford, Ill.

Power Units

BALDWIN-LIMA-HAMILTON CORP.
545 No. 3rd St.
Hamilton, Ohio
CONTINENTAL MOTORS CORP.
205 Market Street
Muskegon, Michigan
CUMMINS ENGINE COMPANY
Columbus, Indiana
HERCULES MOTOR CORP.
101 11th St., S.E.
Canton 2, Ohio
NORDBERG MFG. CO.
3073 So. Chase Avenue
Milwaukee 1, Wisconsin

R. H. SHEPPARD CO., INC.
Hanover, Pennsylvania

Power Units Pump Take-Off

GRAY MARINE MOTOR COMPANY
710 Canton Avenue
Detroit 7, Michigan

Presses, Arbor, Electric & Hydraulic

LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

Pressure Switches

PENN CONTROLS, INC.
Goshen, Indiana

Pressuregraph

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pennsylvania

ELECTRO PRODUCTS LABORATORIES, INC.
4501 North Ravenswood Avenue
Chicago 40, Illinois

Pump Calibrating Test Stands

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett Street
Pittsburgh 8, Pennsylvania

Pumping Units, Diesel

See also "Diesel Pumping Units".

BURMEISTER & WAIN AMERICAN CORP.
17 Battery Place
New York 4, N. Y.

CONSOLIDATED DIESEL ELECTRIC
(Box 1353) Canal & Ludlow Sts.
Stamford, Conn.

VIKING PUMP CO.
4th & Jorgensen Sts.
Cedar Falls, Iowa

Pumps, Automatic Reversing

BROWN & SHARPE MANUFACTURING COMPANY
Providence 1, Rhode Island

TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.

VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Centrifugal

BROWN & SHARPE MFG. CO.
Providence 1, R. I.

GARDNER-DENVER CO.
Quincy, Illinois

GRAY MARINE MOTOR CO.
710 Canton Avenue
Detroit 7, Michigan

JOHN REINER & CO.
12-12 37th Avenue
Long Island City, N. Y.

Pumps, Centrifugal Corrosion Resistant

NATIONAL CARBON COMPANY
DIVISION OF UNION CARBIDE AND CARBON CORP.
30 E. 42nd St.
New York, New York

Pumps, Centrifugal, Horizontal

GARDNER-DENVER COMPANY
Quincy, Illinois

Pumps, Circulating

GARDNER-DENVER COMPANY
Quincy, Illinois

Pumps, Cooling Water

GARDNER-DENVER COMPANY
Quincy, Illinois

GRAY MARINE MOTOR CO.
710 Canton Avenue
Detroit 7, Michigan

SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis, Ind.

VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Fuel Oil Injection

See also "Injection Equipment", etc.

AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.

C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio

G & K DIESEL SERVICE
12 Atlantic Avenue
Boston 10, Massachusetts

GERHARDT'S DIESEL FUEL INJECTION SERVICE
2501 Jefferson Highway
New Orleans, La.

HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2, Connecticut

SCINTILLA MAGNETO DIV.
BENDIX AVIATION CORP.
Sidney, N. Y.

Pumps, Fuel Transfer

BROWN & SHARPE MFG. CO.
235 Promenade Street
Providence 1, Rhode, Island

C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio

GEO. D. ROPER CORP.
173 Blackhawk Park Avenue
Rockford, Ill.

TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.

VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Hydraulic

BROWN & SHARPE MANUFACTURING COMPANY
Providence 1, R. I.

PESCO PRODUCTS DIVISION
BORG-WARNER CORP.
24700 North Miles Road
Bedford, Ohio

JOHN REINER & CO.
12-12 37th Avenue
Long Island City, N. Y.

GEORGE D. ROPER CORPORATION
173 Blackhawk Avenue
Rockford, Illinois

Pumps, Hydraulic Controls

GEORGE D. ROPER CORPORATION
173 Blackhawk Park Avenue
Rockford, Illinois

TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.

VIKING PUMP CO.
4th & Jorgensen Sts.
Cedar Falls, Iowa

Pumps, Lubricating Oil

BROWN & SHARPE MFG. CO.
235 Promenade St.
Providence 1, Rhode Island

EATON MANUFACTURING COMPANY
740 East 140 Street
Cleveland, Ohio

MANZEL DIVISION
FRONTIER INDUSTRIES, INC.
271 Babcock Street
Buffalo 10, N. Y.

GEO. D. ROPER CORP.
173 Blackhawk Avenue
Rockford, Ill.

SCHWITZER-CUMMINS CO.
1125 Massachusetts Avenue
Indianapolis 7, Indiana

TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.

VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Oil

GEO. D. ROPER CORP.
173 Blackhawk Park Avenue
Rockford, Ill.

VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Rotary Gear Type

BROWN & SHARPE MFG. CO.
235 Promenade Street
Providence 1, R. I.

INTERSTATE DIESEL SERVICE, INC.
7120 Carnegie Avenue
Cleveland 3, Ohio

JOHN REINER & CO.
12-12 37th Avenue
Long Island City, N. Y.

GEO. D. ROPER CORP.
173 Blackhawk Park Avenue
Rockford, Ill.

TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.

VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Rotary, Hand-Driven

BOWSER, INC.
Fort Wayne 2, Indiana

JOHN REINER & CO.
12-12 37th Avenue
Long Island City, N. Y.

Pumps, Rotary, Screw Type

JOHN REINER & CO.
12-12 37th Avenue
Long Island City, N. Y.

Pumps, Rotary, Vane-type

JOHN REINER & CO.
12-12 37th Avenue
Long Island City, N. Y.

Pumps, Stripped Models

BROWN & SHARPE MFG. CO.
235 Promenade Street
Providence 1, R. I.

JOHN REINER & CO.
12-12 37th Avenue
Long Island City, N. Y.

TUTHILL PUMP CO.
939 E. 95th St.
Chicago 19, Ill.

VIKING PUMP CO.
4th & Jorgensen Streets
Cedar Falls, Iowa

Pumps, Vacuum

GARDNER-DENVER COMPANY
Quincy, Illinois

JOHN REINER & CO.
12-12 37th Avenue
Long Island City, N. Y.

READ STANDARD CORP.
370 Lexington Avenue
New York 17, N. Y.

Purifiers, Fuel Oil
See also "Reclaimers, Oil"; and headings under "Oil".
CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey
THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.
FRAM CORP.
Providence 16, R. I.
THE HILLIARD CORP.
120 West 4th St.
Elmira, N. Y.
HONAN-CRANE CORP.
HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana
THE SHARPLES CORPORATION
2300 Westmoreland Street
Philadelphia 40, Pennsylvania
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

Purifiers, Industrial Oil
See Heading Above.
CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana
THE SHARPLES CORPORATION
2300 Westmoreland Street
Philadelphia 40, Pennsylvania
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

Purifiers, Lubricating Oil
See also "Reclaimers, Oil"; and headings under "Oil".
CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey
THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.
FRAM CORPORATION
Providence 16, Rhode Island
THE HILLIARD CORP.
120 West 4th Street
Elmira, N. Y.
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana
THE SHARPLES CORPORATION
2300 Westmoreland Street
Philadelphia 40, Pennsylvania
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

Purifiers, Oil
See heading above.
CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey
THE DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.
FRAM CORP.
Providence 16, R. I.
THE HILLIARD CORP.
120 West Fourth St.
Elmira, New York
HONAN-CRANE CORP.
Subsidiary of HOUDAILLE-HERSHEY CORP.
305 Wabash Avenue
Lebanon, Indiana
THE SHARPLES CORPORATION
2300 Westmoreland Street
Philadelphia 40, Pennsylvania
U. S. HOFFMAN MACHINERY CORP.
INDUSTRIAL FILTRATION DIV.
219 Lamson Street
Syracuse, New York
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

Pyrometers, Exhaust
ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.

Pyrometers, Portable
ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.

Racks, Gear
BRAD FOOTE GEAR WORKS, INC.
1315 South Cicero Ave.
Cicero 50, Illinois

Radiators, Engine Cooling
HARRISON RADIATOR DIV.
GENERAL MOTORS CORP.
Washburn Street
Lockport, Ill.
MC CORD CORPORATION
Riopelle at Egrand Blvd.
Detroit 11, Michigan

Reamers, Adjustable, Replaceable Blades
LEMPCO PRODUCTS, INC.
Dunham Road
Bedford, Ohio

Reclaimers, Oil
See also headings under "Purifiers" and "Oil".
THE HILLIARD CORP.
120 West 4th St.
Elmira, N. Y.

Reducers, Speed
BRAD FOOTE GEAR WORKS, INC.
1315 South Cicero Avenue
Cicero 50, Illinois

Regulators, Current & Voltage
See also headings under "Voltage".
DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Ave.
Anderson, Indiana
ELECTRIC REGULATOR CORP.
Pearl Street
Norwalk, Connecticut

Regulators, Generator Voltage
AMERICAN BOSCH CORPORATION
3664 Main Street
Springfield, Massachusetts
BURLINGTON INSTRUMENT COMPANY
203 N. 3rd Street
Burlington, Iowa
ELECTRIC REGULATOR CORP.
Pearl Street
Norwalk, Connecticut
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Regulators, Temperature
AMERICAN MOTORS CO.
21 Nevin Avenue
Richmond 5, Calif.
FULTON-SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee
PENN CONTROLS, INC.
Goshen, Indiana
THE POWERS REGULATOR CO.
3400 Oakton Street
Skokie, Illinois

Relays
AUTOMATIC SWITCH CO.
391 Lakeside Ave.
Orange, New Jersey
SYNCHRO-START PRODUCTS, INC.
8151 North Ridgeway Ave.
Skokie, Illinois

Relays, Sensitive
WESTON ELECTRICAL INSTRUMENT CO.
614 Frelinghuysen Avenue
Newark 5, New Jersey

Repairs, Cold, Machinery Parts and Pressure Vessels
METALOCK REPAIR SERVICE, INC.
Cor. 48th Ave. & 37th St.
Long Island City, N. Y.

Repairs, Diesel
See also "Diesel Repairs"; "Diesel Engines Reconditioned".
BRODIE SYSTEM
115 Clifton Place
Brooklyn 5, New York

Replacement Engines for Ford and Chevrolet Trucks
HERCULES MOTOR CORP.
101 11th Street S.E.
Canton 2, Ohio

Residual Fuel Purifiers
THE DELAVAL SEPARATOR COMPANY
Poughkeepsie, New York

Reversing Switches
COLUMBIA ELECTRIC MANUFACTURING CO.
4519 Hamilton Avenue
Cleveland 14, Ohio

Rheostats, Plating Tank Type
COLUMBIA ELECTRIC MANUFACTURING CO.
4519 Hamilton Avenue
Cleveland 14, Ohio

Rotary Pumps
JOHN REINER & CO.
12-12 37th Avenue
Long Island City, N. Y.

Rotor Blower Service Tools
BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pennsylvania
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Rust Preventives
See also "Anti-Rust Compounds"
ASHLAND OIL & REFINING CO.
Ashland, Kentucky
OAKITE PRODUCTS, INC.
22 C Rector Street
New York 6, N. Y.
SINCLAIR REFINING CO.
600 Fifth Avenue
New York 20, N. Y.
STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street
San Francisco 20, California
TURCO PRODUCTS INC.
6135 So. Central Avenue
Los Angeles, Calif.

Rust Removers
OAKITE PRODUCTS, INC.
22 C Rector Street
New York 6, N. Y.
TURCO PRODUCTS INC.
6135 So. Central Avenue
Los Angeles, Calif.

Safety Controls, Engine
See also "Controls, Engine Safety"
FULTON-SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tennessee
PENN CONTROLS, INC.
Goshen, Indiana
SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Ave.
Skokie, Ill.

Scale Removal
OAKITE PRODUCTS, INC.
22 C Rector St.
New York 6, N. Y.

Scavenging Air Blowers
MIEHLE-DEXTER SUPERCHARGER DIVN.
THE DEXTER FOLDER COMPANY
Racine, Wisconin

Schools, Diesel Mechanics
See also "Diesel Schools".
INTERSTATE TRAINING SERVICE
4035 N. E. Sandy Blvd.
Portland, Oregon
UTILITIES ENGINEERING
2525 Sheffield Avenue
Chicago 14, Illinois

Screw Machine Products
HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2, Connecticut
WEATHERHEAD COMPANY
300 East 131st St.
Cleveland 8, Ohio

Screw Machine Products, Hardened & Ground
HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2, Connecticut

Sealing Rings
C. LEE COOK MFG. CO.
916 South 8th Street
Louisville 3, Kentucky

Seals, Automatic Shaft
SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis 7, Ind.

Separators
See also headings under "Centrifuges"; "Conditioners"; "Purifiers"; "Clarifiers".
CENTRICO, INC.
75 West Forest Avenue
Englewood, New Jersey
DE LAVAL SEPARATOR CO.
Poughkeepsie, N. Y.

Shafts, Hardened and Ground
ELLWOOD CITY FORGE CO.
Ellwood City, Pennsylvania

Shafts, Steel, Carbon Alloy
ERIE FORGE & STEEL CORPORATION
15 & Cascade Streets
Erie, Pennsylvania

Silencers, Air Filter, Intake
AMERICAN AIR FILTER CO., INC.
Central Avenue
Louisville 8, Kentucky
BURGESS-MANNING CO.
749 East Park Ave.
Libertyville, Ill.

Silencers, Exhaust
See also headings under "Mufflers".
BURGESS-MANNING CO.
749 East Park Ave.
Libertyville, Ill.
DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin
KITTELL MUFFLER & ENGINEERING CO.
915 South Santa Fe Avenue
Los Angeles, California
MARINE PRODUCTS & ENGINEERING COMPANY
150 Nassau Street
New York 38, New York
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.
THE FLUOR CORP., LTD.
2500 So. Atlantic Blvd.
Los Angeles 22, Calif.
WINSLOW ENGINEERING CO.
4069-73 Hollis Street
Oakland 8, Calif.

Silencers, Intake
See heading above.
AIR MAZE CORP.
5200 Harvard Avenue
Cleveland 5, Ohio
BURGESS-MANNING CO.
749 East Park Ave.
Libertyville, Ill.
DIESEL PLANT SPECIALTIES COMPANY
424 Portage Street
Stevens Point, Wisconsin
KITTELL MUFFLER & ENGINEERING CO.
915 South Santa Fe Avenue
Los Angeles, California
MAXIM SILENCER COMPANY
85 Homestead Avenue
Hartford 5, Connecticut
THE FLUOR CORP., LTD.
2500 So. Atlantic Blvd.
Los Angeles 22, Calif.

Smoke Meters
BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.

Snubbers, Intake & Exhaust
BURGESS-MANNING CO.
749 East Park Avenue
Libertyville, Illinois

Snubbers, Spark Arresting
BURGESS-MANNING CO.
749 East Park Avenue
Libertyville, Illinois

Solenoids, D. C., Continuous Duty
SYNCHRO-START PRODUCTS, INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

Solvents
CITIES SERVICE OIL CO.
70 Pine Street
New York, N. Y.
STANDARD OIL CO. OF CALIF.
225 Bush Street
San Francisco, California

Solvents, Degreasing
See also "Degreasers"
OAKITE PRODUCTS, INC.
22 C Rector Street
New York, N. Y.

Solvents for Petroleum Residues
OAKITE PRODUCTS, INC.
19 Rector Street
New York 6, N. Y.

Spark Arrestors
KITTELL MUFFLER & ENGINEERING CO.
915 South Santa Fe Avenue
Los Angeles, California
MAXIM SILENCER CO.
85 Homestead Ave.
Hartford 5, Conn.

Spark Plugs
THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio

Special Maintenance Tools
BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7000 Bennett Street
Pittsburgh 8, Pa.
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Special Tools, Mechanical Gear Box
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan

Speed Reducers and Increasers
BRAD FOOTE GEAR WORKS, INC.
1315 South Cicero Ave.
Cicero 50, Illinois
THE SNOW-NABSTEDT GEAR CORP.
351 Welton Street
Hamden, Conn.

Spray Nozzles, Fuel Injection
See also under "Nozzles"; "Valves"
AMERICAN BOSCH CORP.
3664 Main St.
Springfield 7, Mass.
C. A. V. DIVISION of LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
GERHARDT'S DIESEL FUEL INJECTION SERVICE
2501 Jefferson Highway
New Orleans, La.
UNEX PRODUCTS CORP.
30 Vessey Street
New York 7, N. Y.

Spray Nozzles, Water
See also "Nozzles, Spray, Water Cooling".
J. F. PRITCHARD & CO.
210 West 10 Street
Kansas City 5, Mo.
THE FLUOR CORP., LTD.
2500 So. Atlantic Blvd.
Los Angeles 22, Calif.

Sprockets
BRAD FOOTE GEAR WORKS, INC.
1315 South Cicero Ave.
Cicero 50, Illinois
DIAMOND CHAIN COMPANY, INC.
445 Kentucky Avenue
Indianapolis 7, Indiana
MORSE CHAIN CO.
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Michigan

Stands Engine
BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7000 Bennett Street
Pittsburgh 8, Pa.

Starting Air Compressors, Engine Driven
See also headings under "Compressors"
INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.

Starting Air Compressors, Motor Driven
See also headings above
INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.

Starting Batteries, Storage
See also headings under "Batteries".
DELCO-REMY DIVISION
GENERAL MOTORS CORP.
2401 Columbus Ave.
Anderson, Indiana
SURRETTE STORAGE BATTERY CO., INC.
Jefferson Avenue
Salem, Mass.

Starting Engines, Gasoline
HERCULES MOTORS CORP.
101 11 Street S.E.
Canton 2, Ohio

Starting Motors, Air
GARDNER-DENVER COMPANY
Quincy, Illinois
INGERSOLL-RAND CO.
11 Broadway
New York, N. Y.
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Starting Motors, Electric
See also "Cranking Motors, Electric".
C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICES, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio

Steam Cleaning Equipment
OAKITE PRODUCTS, INC.
22 C Rector Street
New York 6, N. Y.
TURCO PRODUCTS, INC.
6135 So. Central Ave.
Los Angeles, Calif.

Steel Castings
See also "Castings"; etc.
HUNT-SPILLER MFG. COMPANY
383 Dorchester Avenue
Boston 27, Mass.

Steel Pipe Welded
AMERICAN LOCOMOTIVE CO.
Schenectady, New York

Strainers, Oil
CUNO ENGINEERING CORP.
80 South Vine St.
Meriden, Conn.
ELLIOTT COMPANY
Jeannette, Penna.
STAPLES & PFEIFFER
528 Bryant Street
San Francisco 17, California
PUROLATOR PRODUCTS, INC.
970 New Brunswick Avenue
Rahway, New Jersey
WINSLOW ENGINEERING CO.
4069 Hollis Street
Oakland 8, California

Strainers, Water
CUNO ENGINEERING CORP.
80 South Vine St.
Meriden, Conn.
ELLIOTT COMPANY
Jeannette, Penna.
STAPLES & PFEIFFER
528 Bryant Street
San Francisco 17, California

Strainers, Water, Single & Duplex
ELLIOTT COMPANY
Jeannette, Pennsylvania
STAPLES & PFEIFFER
528 Bryant Street
San Francisco 17, California
WINSLOW ENGINEERING CO.
4069 Hollis Street
Oakland 8, California

Supercharging Blowers
See also "Blowers, Scavenging and Supercharging"; "Turbochargers, Superchargers".
ELLIOTT COMPANY
Jeannette, Penna.
MIEHLE-DEXTER SUPERCHARGER DIVN.
THE DEXTER FOLDER COMPANY
Racine, Wisconsin
READ STANDARD CORP.
370 Lexington Ave.
New York 17, N. Y.
SCHWITZER-CUMMINS CO.
1125 Massachusetts Ave.
Indianapolis, Ind.

Switchboards and Instruments
THE IDEAL ELECTRIC & MFG. CO.
Mansfield, Ohio
WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Avenue
Newark 5, New Jersey

Switches Automatic Transfer
AUTOMATIC SWITCH CO.
391 Lakeside Avenue
Orange, New Jersey

Switches, Manual
SCINTILLA MAGNETO DIV.
BENDIX AVIATION CORP.
Sidney, N. Y.

Switches, Solenoid
DELCO-REMY DIV.
GENERAL MOTORS CORP.
2401 Columbus Avenue
Anderson, Indiana

Switches, Starting
LEECE-NEVILLE COMPANY
5109 Hamilton Avenue
Cleveland 14, Ohio
SYNCHO-START PRODUCTS, INC.
8151 N. Ridgeway Avenue
Skokie, Illinois

Switchgear
ELECTRIC MACHINERY & MFG. CO.
800 Central Avenue
Minneapolis 13, Minn.
THE IDEAL ELECTRIC & MFG. CO.
Mansfield, Ohio

Synchronizers, Automatic
BURLINGTON INSTRUMENT CO.
203 N. 3d St.
Burlington, Iowa
ELECTRIC MACHINERY MFG. CO.
800 Central Avenue
Minneapolis 13, Minn.

Systems, Fuel Injection
See also headings under "Injection"; "Fuel"; "Nozzles", etc.
C. A. V. DIVISION OF LUCAS ELECTRICAL SERVICE, INC.
14820 Detroit Avenue
Cleveland 7, Ohio
HARTFORD MACHINE SCREW CO.
Box 1440
Hartford 2, Connecticut
SCINTILLA MAGNETIC DIVISION
BENDIX AVIATION CORP.
Sidney, New York

Tachometers, Centrifugal
HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York

Tachometers, Electrical
ELECTRO PRODUCTS LABORATORIES, INC.
4501 N. Ravenswood Avenue
Chicago 40, Illinois
RELIANCE ELECTRIC & ENGINEERING CO.
1088 Ivanhoe Road
Cleveland 10, Ohio
WESTON ELECTRICAL INSTRUMENT COMPANY
614 Frelinghuysen Avenue
Newark 5, New Jersey

Tachometers, Hand
BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7000 Bennett St.
Pittsburgh 8, Pa.
HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York

Tachometers, Mechanical
HERMAN H. STICHT CO., INC.
27 Park Place
New York 7, New York

Temperature Recorders
BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7000 Bennett St.
Pittsburgh 8, Pa.
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

Temperature Regulators, Cooling Water
AMERICAN MOTORS CO.
21 Nevin Ave.
Richmond, Calif.
DETROIT CONTROLS CORP.
5900 Trumbull Avenue
Detroit, Michigan
FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tenn.
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

Test Stands, Diesel Fuel Injector
See also "Injector Test Stands"; etc.
BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7000 Bennett St.
Pittsburgh 8, Pa.
AUTOMOTIVE PRODUCTS, INC.
1700 Southeast Grand Avenue
Portland 14, Oregon

Test Stands, Diesel Fuel Pump
BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7000 Bennett St.
Pittsburgh 8, Pa.

Test Stands, Diesel Nozzle
BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7000 Bennett St.
Pittsburgh 8, Pa.

Testers, Battery
WILLIARD STORAGE BATTERY CO.
246 East 131 Street
Cleveland 1, Ohio

Testing Instruments, Electrical
WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Avenue
Newark 5, New Jersey

Testing Instruments, Oil, Engine Room Type
GERIN CORPORATION
Avon, New Jersey

Tests, Diesel Engine
LANOVA CORPORATION
38-15 30th Street
Long Island City 1, N. Y.

Thermatic Fan Drive
SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Thermocouples
ILLINOIS TESTING LABORATORIES, INC.
420 N. LaSalle St.
Chicago 10, Ill.

Thermometers
ROCHESTER MFG. CO., INC.
34 Rockwood Street
Rochester 10, New York

Thermometers, Bi-metallic, Glass
WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Avenue
Newark 5, New Jersey

Thermometers, Dial Indicator
BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7000 Bennett St.
Pittsburgh 8, Pa.
THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois

Thermometers, Dial Indicating, Distance Type
THE POWERS REGULATOR CO.
3410 Oakton Street
Skokie, Illinois
ROCHESTER MFG. CO., INC.
34 Rockwood Street
Rochester 10, N. Y.

Thermometers, Distant Reading, Resistance Type
WESTON ELECTRICAL INSTRUMENT CORP.
614 Frelinghuysen Avenue
Newark 5, New Jersey

Thermometers, Flue Gas
BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7000 Bennett St.
Pittsburgh 8, Pa.
ROCHESTER MFG. CO., INC.
34 Rockwood Street
Rochester 10, N. Y.

Thermometers, Indicating
BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7000 Bennett St.
Pittsburgh 8, Pa.

ROCHESTER MFG. CO., INC.
34 Rockwood Street
Rochester 10, New York

Thermometers, Portable Recording

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.
THE ELECTRIC AUTO-LITE CO.
Toledo 1, Ohio

Thermostats

DETROIT CONTROLS
5900 Trumbull Ave.
Detroit, Michigan

Timing Chains

See also "Chains, Timing"

DIAMOND CHAIN COMPANY, INC.
494 Kentucky Ave.
Indianapolis 7, Indiana
LINK-BELT CO.
220 S. Belmont Ave.
Indianapolis 6, Ind.
MORSE CHAIN CO.
A BORG-WARNER INDUSTRY
7601 Central Avenue
Detroit 10, Michigan

Tools, Diesel Engine Service

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.
SNAP-ON TOOLS CORP.
Kenosha, Wisconsin

Tools, Mechanic's Hand

BROWN & SHARPE MFG. CO.
Providence 1, R. I.
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Bldg.
Detroit 2, Michigan
SNAP-ON TOOLS CORP.
Kenosha, Wis.

Torque Converters

ALLISON DIVISION
GENERAL MOTORS CORP.
Indianapolis, Indiana

Towers, Cooling

AMERICAN LOCOMOTIVE CO.
Schenectady, New York

Transmission Shafts Hard Chrome Plated & Ground

CLEVELAND HONE & MFG. CO.
8816 Harkness Road
Cleveland 6, Ohio

Transmissions

ALLISON DIVISION
GENERAL MOTORS CORP.
Indianapolis, Indiana
BRAD FOOTE GEAR WORKS, INC.
1315 South Cicero Ave.
Cicero 50, Illinois

Tubing, Corrugated, Flexible Metallic

See also headings under "Flexible" and "Hose".

ALLIED METAL HOSE CO.
37-46 Ninth Street
Long Island City 1, New York
THE AMERICAN BRASS CO.
AMERICAL METAL HOSE BRANCH
698 S. Main Street
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
309 Dyckman Street
New York 34, New York
FLEXONICS CORPORATION
1363 South 3rd Ave.
Maywood, Illinois

Tubing, Flexible Metal

See heading above.

AEROQUIP CORPORATION
300 S. East Avenue
Jackson, Michigan
THE AMERICAN BRASS COMPANY
AMERICAN METAL HOSE BRANCH
698 S. Main Street
Waterbury 20, Conn.
ATLANTIC METAL HOSE CO., INC.
309 Dyckman St.
New York 34, New York
FLEXONICS CORP.
1363 South 3rd Ave.
Maywood, Illinois

Tubing, Flexible, Non-Metallic

AEROQUIP CORPORATION
300 S. East Avenue
Jackson, Michigan
WEATHERHEAD COMPANY
300 East 131st St.
Cleveland 8, Ohio

Tubing, High Pressure

AEROQUIP CORPORATION
300 S. East Avenue
Jackson, Michigan

Turbochargers, Superchargers

See also headings under "Blowers"; "Supercharging Blowers"; "Scavenging Air Blowers".

ELLIOTT COMPANY
Jeannette, Penna.
SCHWITZER-CUMMINS COMPANY
1125 Massachusetts Avenue
Indianapolis 7, Indiana

Underwriter's Fire Pump Controls

UNIVERSAL AUTOMATIC ENGINE CONTROLLER
53 West Jackson Blvd.
Chicago 4, Illinois

Unit Injectors, Fuel Oil

AMERICAN BOSCH CORP.
3664 Main Street
Springfield 7, Mass.
SCINTILLA MAGNETO DIV.
BENDIX AVIATION CORP.
Sidney, New York
UNEX PRODUCTS CORP.
30 Vesey Street
New York 7, N. Y.

Valve Discs

THE ANCHOR PACKING CO.
401 N. Broad St.
Philadelphia 8, Pa.
J. H. H. VOSS CO., INC.
785 E. 144th Street
New York 54, N. Y.

Valve Guides

EATON MANUFACTURING COMPANY
740 East 140th St.
Cleveland 10, Ohio

Valve Plates & Discs, all Types & Sizes

J. H. H. VOSS CO., INC.
785 E. 144th Street
New York 54, N. Y.

Valve Regrinders

CEDAR RAPIDS ENGINEERING CO.
902 17th St. N.E.
Cedar Rapids, Iowa
VAN NORMAN COMPANY
3640 Main Street
Springfield 7, Mass.
WATERBURY TOOL DIVISION
VICKERS, INC.
172 East Aurora Street
Waterbury, Conn.

Valve Seat Grinders

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.
CEDAR RAPIDS ENGINEERING CO.
902 17th St. N.E.
Cedar Rapids, Iowa
KENT-MOORE ORGANIZATION, INC.
5-105 General Motors Building
Detroit 2, Michigan
WATERBURY TOOL DIVISION
VICKERS, INC.
172 East Aurora Street
Waterbury, Conn.

Valve Seat Insert Tools

CEDAR RAPIDS ENGINEERING CO.
902 17th St. N.E.
Cedar Rapids, Iowa

Valve Seat Inserts

PETERSON WELDING LABS., INC.
1423 Virginia Avenue
Kansas City 6, Missouri
WATERBURY TOOL DIVISION
VICKERS, INC.
172 East Aurora St.
Waterbury, Conn.

Valve Seats

EATON MANUFACTURING CO.
740 East 140 Street
Cleveland 10, Ohio

Valves, Air, Ammonia & Gas Compressor

J. H. H. VOSS CO. INC.
785 E. 144th St.
New York 54, N. Y.

Valves, Engine Indicator

BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 Bennett St.
Pittsburgh 8, Pa.
KIENE DIESEL ACCESSORIES INC.
10352 Pacific Ave.
Franklin Park, Illinois

Valves, Packless

FULTON SYLPHON DIVISION
ROBERTSHAW-FULTON CONTROLS CO.
Knoxville 4, Tenn.

Valves, Solenoid Operated

AUTOMATIC SWITCH CO.
391 Lakeside Ave.
Orange, New Jersey

Valves, Thermostatic

AMERICAN MOTORS CO.
21 Nevin Ave.
Richmond, Calif.
THE POWERS REGULATOR COMPANY
3410 Oakton Street
Skokie, Illinois

Variable Speed Drives

ELECTRIC MACHINERY MFG. CO.
800 Central Avenue
Minneapolis 13, Minnesota

Vessels, Pressure

AMERICAN LOCOMOTIVE COMPANY
Schenectady, New York

Vibration Control

THE KORFUND COMPANY, INC.
48-20A 32nd Place
Long Island City 1, New York

Vibration Eliminators

ALLIED METAL HOSE CO.
37-46 Ninth St.
Long Island City 1, New York
ATLANTIC METAL HOSE CO., INC.
309 Dyckman Street
New York 34, New York

Viscosity Indicating Devices

THE GERIN CORPORATION
Avon, New Jersey
VISCO-METER CORP.
315 Grote Street
Buffalo 7, New York

Voltage Control

ELECTRIC REGULATOR CORP.
Pearl Street
Norwalk, Connecticut

Voltage Regulators

BURLINGTON INSTRUMENT CO.
203 W. 3rd St.
Burlington, Iowa
DELCO-REMY DIVISION
GENERAL MOTORS CORPORATION
2401 Columbus Avenue
Anderson, Indiana
ELECTRIC MACHINERY MFG. CO.
800 Central Avenue
Minneapolis 13, Minn.
ELECTRIC REGULATOR CORP.
Pearl Street
Norwalk, Connecticut

Volt-Ammeters, Clamp-on Type

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave.
Cleveland 14, Ohio

Waste Heat Boilers

See also "Boilers, Waste Heat"; "Boilers, Exhaust Gas".

AMERICAN LOCOMOTIVE CO.
Schenectady, New York
MAXIM SILENCER CO.
85 Hometead Ave.
Hartford 5, Conn.

Water Cooling Equipment

See also headings under "Coolers" and "Heat Exchangers"; "Exchangers, Heat".

AEROFIN CORPORATION
410 S. Geddes Street
Syracuse 1, New York
AMERICAN LOCOMOTIVE CO.
Schenectady, New York
J. F. PRITCHARD & CO.
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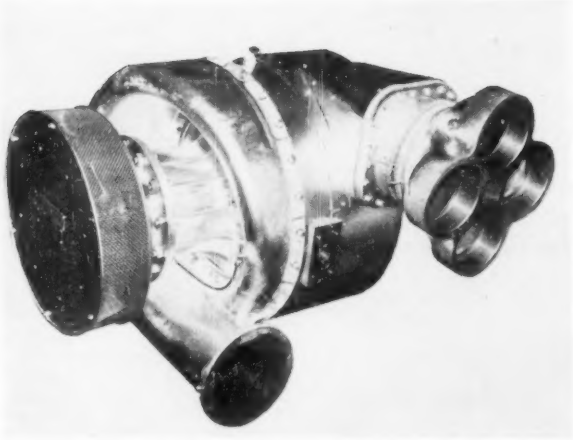
A Look at Turbocharging

By Rudolph Birmann, DeLaval Steam Turbine Co.

Low or high pressure? Blowdown or constant pressure? If these terms need definition, this is the article for you. Here, an expert in the field reviews turbocharger-engine combinations and systems along with their application, and shows their effects on engine performance and characteristics.



A view of the DeLaval high-pressure turbocharger which incorporates a pulse converter system developed by DeLaval engineers.

TODAY, the advantages of turbocharging are clearcut and well understood. In retrospect it is somewhat surprising that they were not recognized long ago. It took many years for the idea, originally proposed by the Swiss engineer, Alfred Buchi, to become accepted—almost two decades in Europe and nearly three decades in the United States, despite continued and persistent effort by Buchi to convince the diesel engine industry that its fears of overloading or overheating the engines by turbocharging were unfounded.

In some installations the turbocharger does very little or no supercharging in the true sense of the word, because it does not substantially increase cylinder pressure at the beginning of compression. It does, however, supply the large quantity of air needed for complete scavenging of hot residual gases in the cylinder clearance space and fills this space with cool, fresh air.

This scavenging decreases the charge temperature at the beginning of compression and though pressure is not increased, a denser charge containing more oxygen is obtained. The additional oxygen in the cylinders permits combustion of a correspondingly increased amount of fuel to the extent that the brake mean effective pressure is raised as much as 25 per cent.

Supercharging in the true sense of the word further increases bmep by further increasing charge density by providing a pressure higher than atmospheric at the beginning of the compression. In this manner, the bmep of many an actual service engine has been doubled.

Many authorities believe that further substantially increased engine ratings are likely as the result of future turbocharger and engine developments—both aimed toward higher supercharging pressures. For this reason, it is of interest to review the turbocharger-engine combination from the viewpoint of the turbocharging system and then to consider the effect of various supercharger pressure ratios and other variables on bmep, thermal efficiency, heat rejection, and other engine design and performance characteristics.

Defining Low and High Pressure Turbocharging

The trend toward higher boost pressures (high-pressure turbocharging) is relatively recent. Up to the present, "low-pressure supercharging" has been predominant and has been identified almost exclusively with the well-known Buchi system. Low-pressure supercharging systems operate with a supercharger pressure ratio of approximately 1.4:1, whereas high-pressure supercharging employs pressure ratios of 2:1 or higher.

Distinction between low-pressure and high-pressure supercharging seems at first glance rather vague and of little significance. As will be shown, however, drastic changes in operation and performance of both the engine and the supercharger are brought about by adoption of high-pressure supercharging.

Before clarifying this, it should be pointed out that there are two systems currently used for connecting the turbine to the engine: the "constant-pressure" system,

and the "blowdown" or "Buchi" system. In the constant-pressure system (Fig. 2) all cylinders discharge into a common exhaust manifold, large enough to cause an almost constant back pressure (or pre-turbine pressure) to be maintained therein. In the blowdown or Buchi system (Fig. 3) individual cylinders (or groups of two or not more than three cylinders having non-overlapping exhaust phases) are connected by separate manifold branches to separate groups of turbine nozzles.

With high-pressure and low-pressure supercharging, and with two distinctly different methods of feeding exhaust gases to the turbine, it is well to review the thermodynamic aspects of the four possible combinations.

Low-Pressure Supercharging—Constant Pressure System

Regardless of inlet manifold pressure or pressure level of the internal cycle, good scavenging is important for good engine performance. Effectiveness of scavenging depends on certain engine design features—total valve areas, intake and exhaust passage configurations, degrees of crankshaft rotation with intake and exhaust valves simultaneously open, and particularly, the difference between inlet manifold pressure and exhaust back pressure, or Δp.

This difference, in turn, depends upon turbocharger quality—specifically, on its component efficiencies (compressor and turbine). Other conditions being equal, the higher the component efficiencies, the greater the Δp and therefore the better the scavenging.

Dependence of Δp on these component efficiencies is shown by curves on Fig. 4. These curves show the relationship between Δp and the combined efficiency of the turbocharger—one curve each for pressure ratios of 1.4, 2.0, 3.0, and 4.0.

For low-pressure supercharging (1.4:1 ratio), the greatest part of the gain in engine performance and output results from scavenging the residual exhaust gases remaining in the clearance volume and replacing them with fresh air. For good scavenging, the ratio of Δp to p (where p is inlet manifold pressure) should be constant and of the order of 0.16.

A contour curve labeled "equally good scavenging" is shown in Fig. 4. This curve connects points of equal Δp and shows that for high-pressure supercharging using $\frac{\Delta p}{p}$ the constant pressure system, a combined efficiency of approximately 60 per cent is required. For low-pressure supercharging a combined efficiency of 80 per cent is necessary. This is higher than is obtainable with even the very best turbochargers, and for this reason the constant pressure system is not ordinarily used for low-pressure supercharging.

Low-Pressure Supercharging—Blowdown System

Until a few years ago most turbocharger installations were of the low-pressure type. As explained, the necessary Δp cannot be obtained with low-pressure supercharging if the constant pressure system is used. Buchi conceived the thought of utilizing energy contained in the exhaust pulsations by making some of it available to the turbine in such a manner that the average back

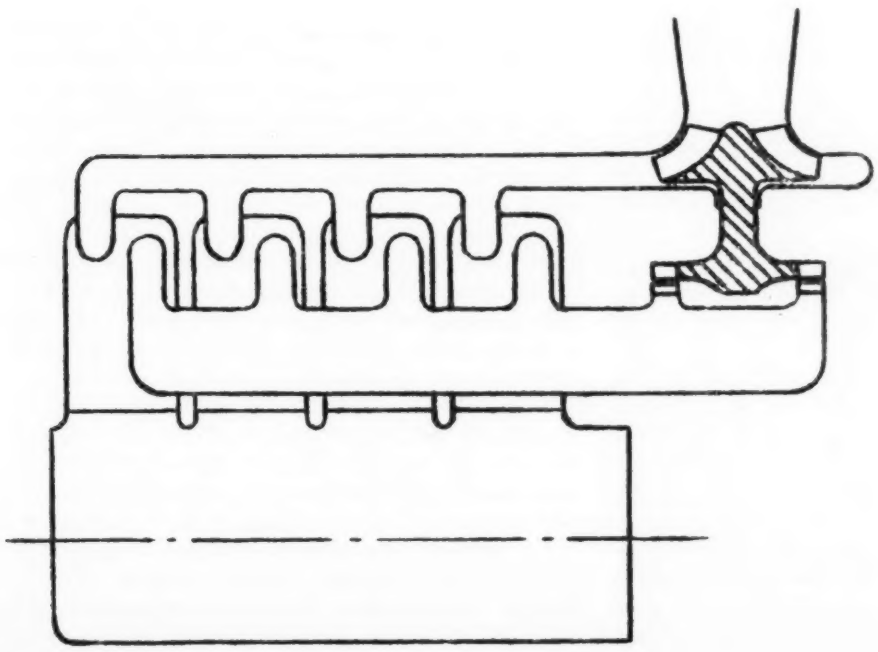


Fig. 2 is illustrative of the constant pressure system which permits full admission to the turbine. Here, all cylinders exhaust into a common manifold.

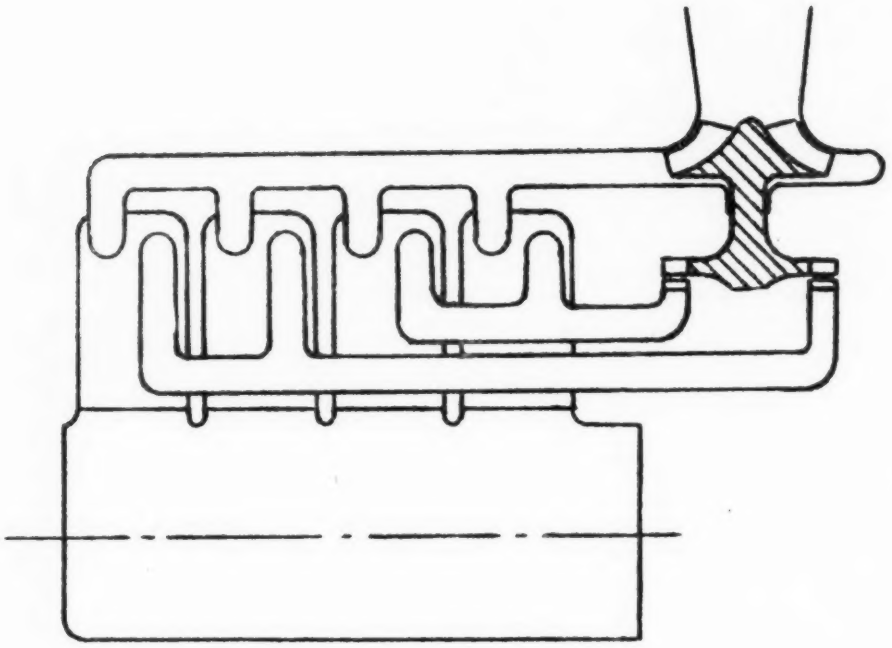


Fig. 3. An illustration of the Buchi or "blowdown" system in which separate manifolds are used to group cylinders.

pressure is lowered sufficiently to obtain the required Δp. This "Buchi" or "blowdown" system is briefly described in conjunction with Fig. 5.

The pulsating energy which the blowdown system attempts to harness is indicated by the triangular "toe" area 1-2-3 in the pressure-volume diagram (Fig. 5). With atmospheric exhaust this toe area can amount to as much as 20 per cent of the engine indicator area; however, only the portion shown by the shading can be made available to the turbine. The difference between these two areas is due to unavoidable throttling losses in the exhaust valves and losses associated with emptying and filling the passages between the exhaust valves and turbine nozzles.

Theoretically at least, the blowdown system has the advantage that during the exhaust phase each cylinder can exhaust (or blow down) to atmospheric pressure. This means that during the scavenging phase immediately following, the exhaust back pressure is momentarily zero, making full supercharger discharge pressure (ordinarily 10 in to 12-in Hg) available for scavenging and cylinder charging.

In this system the turbine must operate with intermittent flow. Only a limited portion of the full nozzle circumference and rotating blading is active at any one time (partial admission). During the active period the expansion ratio, with which the turbine operates, varies continuously within wide limits. All of this involves: (1) windage of momentarily idle turbine blading, (2) filling and emptying of stationary passages and rotating blade channels, and (3) positive and negative shock angles for the turbine blading. All this entails losses, causing the turbine to operate with relatively low efficiency.

Thus, the turbine can convert into net output only a small portion of the energy available to it (shaded portion, Fig. 5), with the result that its nozzle area must be so adjusted that back pressure cannot be permitted to drop to atmospheric during the scavenging period. This means that less than full compressor discharge pressure becomes available to the engine as Δp.

High-Pressure Supercharging—Constant Pressure System

Pressure ratio curves of Fig. 4, labeled 2.0, 3.0, and 4.0, pertain to high-pressure supercharging. From the points of intersection of these curves with the curve labeled "line for equally good scavenging", it will be noted that the constant pressure system requires the achievement by the turbocharger of a combined efficiency of about 60 per cent. Fortunately with the constant pressure system, the turbine operates with steady flow, full admission, and (at any one engine load) a constant expansion ratio—conditions permitting attainment of the maximum possible turbine efficiency.

Despite the fact that these operating conditions are favorable to turbine operation, combined efficiencies of 45 to 50 per cent were all that were obtainable until quite recently. These efficiencies were insufficient for application to the constant pressure system. Today, however, combined efficiencies of 65 per cent or even higher are being obtained with, for example, the new De Laval supercharger. This makes the constant-pressure system in connection with high-pressure supercharging

not only feasible but an extremely attractive proposition.

In the constant-pressure system, the initial pressure with which the turbine operates is also the back pressure against which the engine must exhaust. Even slight back pressure makes available large amounts of exhaust energy to the turbine, and exhaust pulsation energy becomes a smaller fraction of the total energy as back pressure increases. This is illustrated qualitatively by the pressure-volume diagram (Fig. 5) where exhaust energies are represented by the areas labeled "constant pressure energy", "total pulsating energy", and "available pulsating energy".

Quantitative relationship between available pulsating energy and total available exhaust energy is given by Fig. 5a, from which it will be noted that for high back pressures—meaning high pressure ratios—the energy of exhaust pulsations becomes a small percentage of the total available energy. This illustrates that the higher the turbocharger pressure ratio, the lower the return from utilization of the pulsating exhaust energy.

High-Pressure Supercharging—Blowdown System

Normally the blowdown system, attempting to utilize energy contained in the exhaust pulsations, makes available to the turbine a larger amount of exhaust energy than does the constant pressure system. As explained (Fig. 5a), this additional energy becomes a smaller percentage of the total the higher the back pressure. Also, the turbine, essentially a steady flow device, does not operate very well with pulsating flow for the reasons given. All this means that for high-pressure supercharging the all-important excess pressures can often be made higher with the constant pressure system than is possible with the blowdown system, and the blowdown system is therefore undesirable for application to high-pressure supercharging.

The Pulse Converter System

For best possible turbine performance—maximum combined efficiency—the turbine should operate with full admission at all times and under conditions of constant expansion ratio at any one engine load. For this reason, it does not lend itself to the direct conversion into mechanical energy of the pulsating energy in the engine exhaust gases.

Recognition of this fact lead to the development by the De Laval Steam Turbine Company of the so-called "pulse converter system", which permits utilization of the pulsating energy under conditions of steady full-admission flow and constant expansion ratio for the turbine.

The pulse converter system (Fig. 6) uses the same type of subdivided exhaust manifold used in the blowdown system. The pulse converter is interposed between the branch outlets and the single turbine inlet.

As its name implies, this device converts energy in exhaust pulsations into a pressure rise, with the result that pressure in the turbine nozzle box is practically

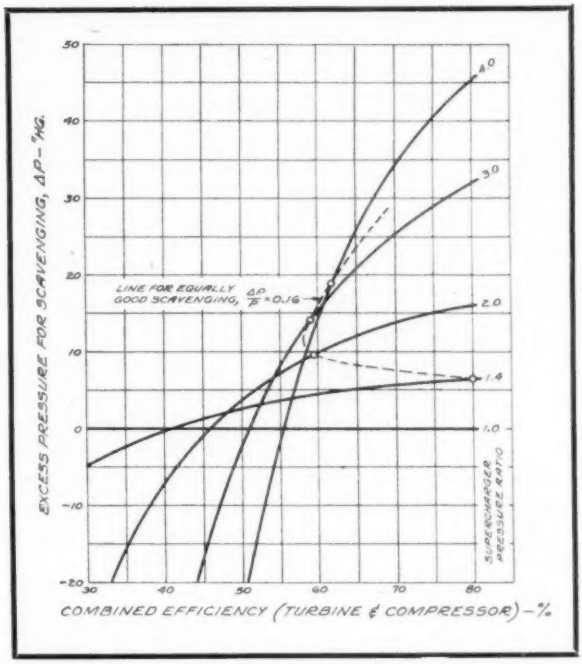


Fig. 4. Illustrates graphically the combined efficiency necessary at different pressure ratios for equally good scavenging.

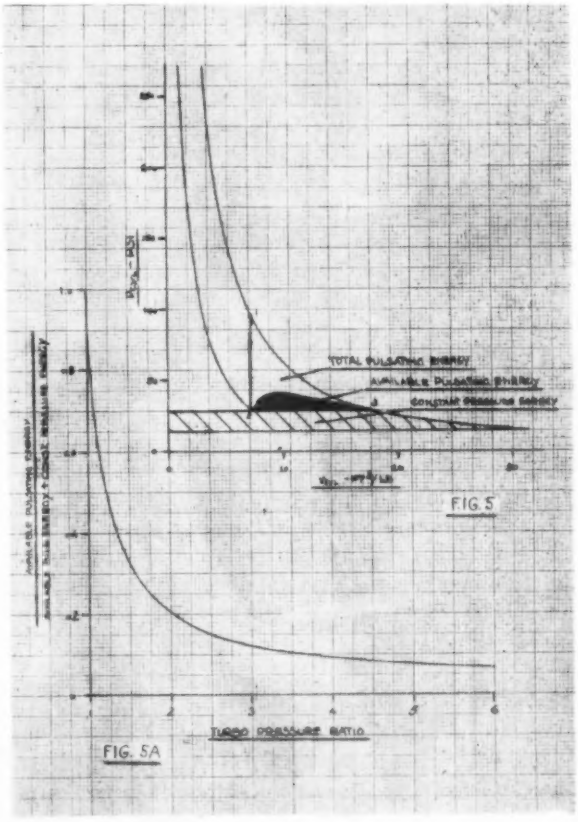


Fig. 5. A pressure-volume diagram where exhaust energies are represented by labled areas. Fig. 5a is a quantitative relationship between available pulsating energy and total available exhaust energy.

constant and substantially higher than the mean of the fluctuating pressures in the manifold branches. This pressure rise represents energy readily available to the turbine, derived from the pulsating portion of the exhaust energy.

The pulse converter (enlarged view, Fig. 6) consists of the primary nozzles (1 and 1A) in which each exhaust manifold branch terminates, a mixing section (2), and the diffuser (3). At any one moment, rapidly fluctuating pressures reach a maximum in one of the several branches. This high pressure is converted into high velocity in the primary nozzle of this particular branch and the high velocity exerts an eductor effect on the other branch or branches. In the next instant conditions are reversed—another branch discharges at maximum velocity and produces an eductor effect on the previously active exhaust manifold branch. By momentum transfer between the high-velocity and low-velocity gas streams (ejector and eductor flows), a fairly uniform high velocity is maintained in the mixing section.

This high velocity corresponds to a low static pressure that is the back pressure "felt", so to speak, by the engine. The high velocity is then converted in the diffuser into a pressure rise which participates in the driving of the turbine. Obviously in common with the constant pressure system, the turbine operates under conditions of steady flow and therefore without energy losses resulting from continuous emptying and filling of the blade channels.

The distinct advantages of the pulse converter system have been demonstrated by tests on a number of different diesel engines having four, six, or eight cylinders. As can be seen from Fig. 1, the pulse converter is a very simple adaptor device. It is also quite versatile inasmuch as it permits the same turbine to be readily connected in a variety of ways to different engines having different sizes and numbers of manifold branches. No modifications to basic turbine configuration are required.

Another advantage of the pulse converter lies in the possibility of so adjusting its passage areas that the most desirable pattern of pressure fluctuations in the exhaust manifold branches is obtained. Specifically, it can be so proportioned that no adverse pressure waves occur in the exhaust manifold branches during the scavenging period. In the blowdown system on the other hand, it is often found that the blowdown has not been completed before the scavenging period begins, reducing the available scavenging pressure differential and thereby the scavenging flow.

Turbocharging Limiting Factors

So far, discussion has covered chiefly the various factors affecting turbocharger performance and operation. It will now be shown how performance and operating characteristics of the engine are affected by the use of higher supercharging pressures.

Theoretically, as the supercharger pressure ratio is increased, more oxygen is crowded into the cylinders, permitting the burning of more fuel, and resulting in higher bmep. There are however, the following practical limitations to this process imposed by considerations of engine design and reliability:

(1) Increased manifold pressure is accompanied by increased cycle peak pressures. If this increase is carried beyond a certain point, general engine strengthening becomes necessary. This is perfectly feasible but perhaps undesirable in the case of existing engines because of cost considerations involved.

(2) Increasing bmep's by raising boost pressures and inlet manifold temperatures increases the engine's thermal loading. The increase which can be tolerated is definitely limited and very often cannot be accomplished without shortening the life of the engine and reducing its reliability.

Since thermal loading so profoundly affects the picture of raising engine output by turbocharging, this subject is now covered in considerable detail.

Thermal Loading—Controlling Factor in Engine Durability

Thermal loading of the engine generally is measured in terms of the total heat rejected to the cooling system. Experience has shown that the rate of heat rejection which occurs when an engine is operating at its rated power output cannot be exceeded without adversely affecting engine life and reliability. It is therefore futile to speculate about the effect of higher and higher boost pressures on the bmep and other engine performance characteristics unless the increase in boost pressure (and temperature) changes the densities and temperatures throughout the entire internal cycle.

Since heat transfer to the cylinder walls is primarily a function of these variables, it is necessary to find the relationship between temperatures and pressures in the cylinders and the amount of heat transferred to the cylinder walls. Without detailing the analytical method evolved for this purpose, its theoretical basis is briefly indicated.

It is known that heat transfer from hot gases to cylinder walls occurs chiefly by convection. Heat transfer rate at any instant can therefore be satisfactorily represented by the well-known relations which apply to other cases of convection, notably forced convection in pipes, under conditions of steady flow. Using the equation shown in conjunction with Fig. 7, total heat loss can then be found by integrating the relations over the full cycle, considering the variation of pressure, temperature, and heat transfer area during the process.

Effect of Supercharging Pressure Ratio with Constant Thermal Loading

Quantitative determination of the heat rejection affords means for computing the effect that raising the inlet manifold pressure, without increasing thermal loading, will have on engine performance. Computations

have been made and results plotted as curves in Fig. 7. Experimental coefficients were selected by trial so as to produce approximate agreement with published data on engine heat losses. Test data for this purpose were rather meager, and lacking more complete test data the results must be regarded as only approximations.

In any theoretical study, it is necessary that certain simplifications and/or assumptions be made to make the problem amenable for a consistent thermodynamic treatment. Here it was assumed that the value of the absolute heat rejected to the cooling system (exclusive of any exhaust manifold cooling) is 9.2 Btu per cu ft of total cylinder volume. This value has been found to apply reasonably well to a number of representative engines under full-load operating conditions. It was furthermore assumed that mechanical efficiency of the engine varies with the bmep as shown by Fig. 8. Finally, a true diesel cycle—constant pressure combustion—was assumed.

Because of the assumptions, results of the study are not necessarily accurate in an absolute sense and may not be exact for every engine. Importance of this theoretical analysis lies, therefore, in the general trends it discloses and their implications, believed to be substantially correct.

If the supercharger pressure ratio is raised while the compression ratio of the engine is held constant, peak cycle pressure obviously increases and can reach a value higher than is desirable or permissible in view of the engine structure and bearing loads. For this reason, investigation was made for two cases—(1) where compression ratio remains constant (13.5:1) and (2) where the compression ratio of the engine is changed to limit peak pressures to 1000 psi. Obviously the latter case entails very low engine compression ratios when supercharger pressure ratios are high—compression ratios not practical for engine operation, particularly starting.

Effect with Heat Rejection and Compression Ratio Held Constant

Curves presented on the right-hand side of Fig. 7 apply to a constant compression ratio of 13.5:1 and depict the effect of supercharger pressure ratio on bmep, brake thermal efficiency, exhaust temperature, relative cooling losses, combustion air excess factor, and engine peak pressure. For each variable, two curves are plotted showing the results with and without intercooling.

Note that if engine thermal loading is not permitted to increase, supercharging without intercooling (broken line) results in only a moderate rise in bmep up to a supercharger pressure ratio of 1.7:1 beyond which there is no further increase, and eventually there is a decrease. If intercooling is used (solid line), the increase in bmep

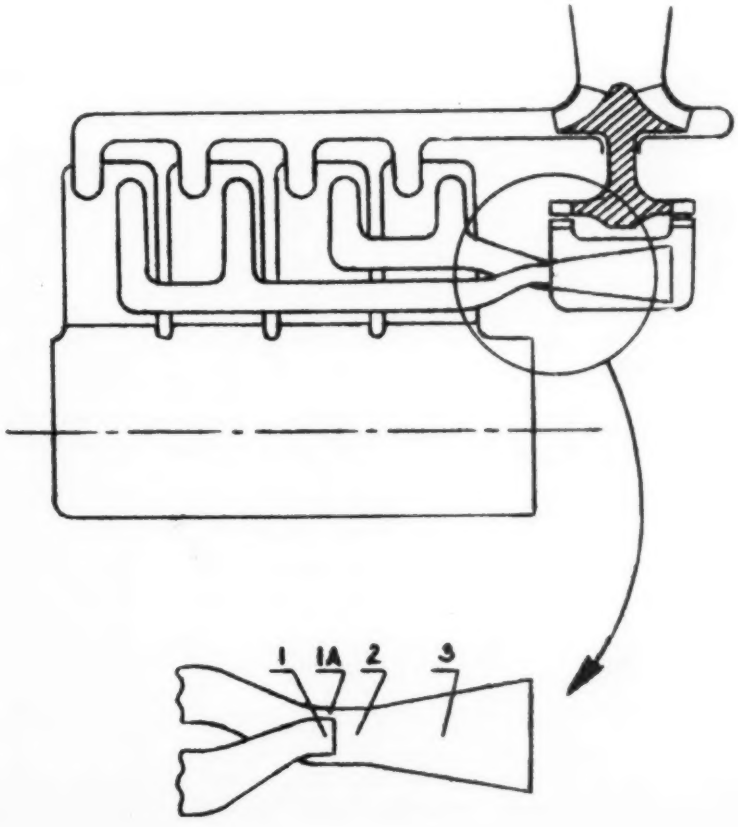


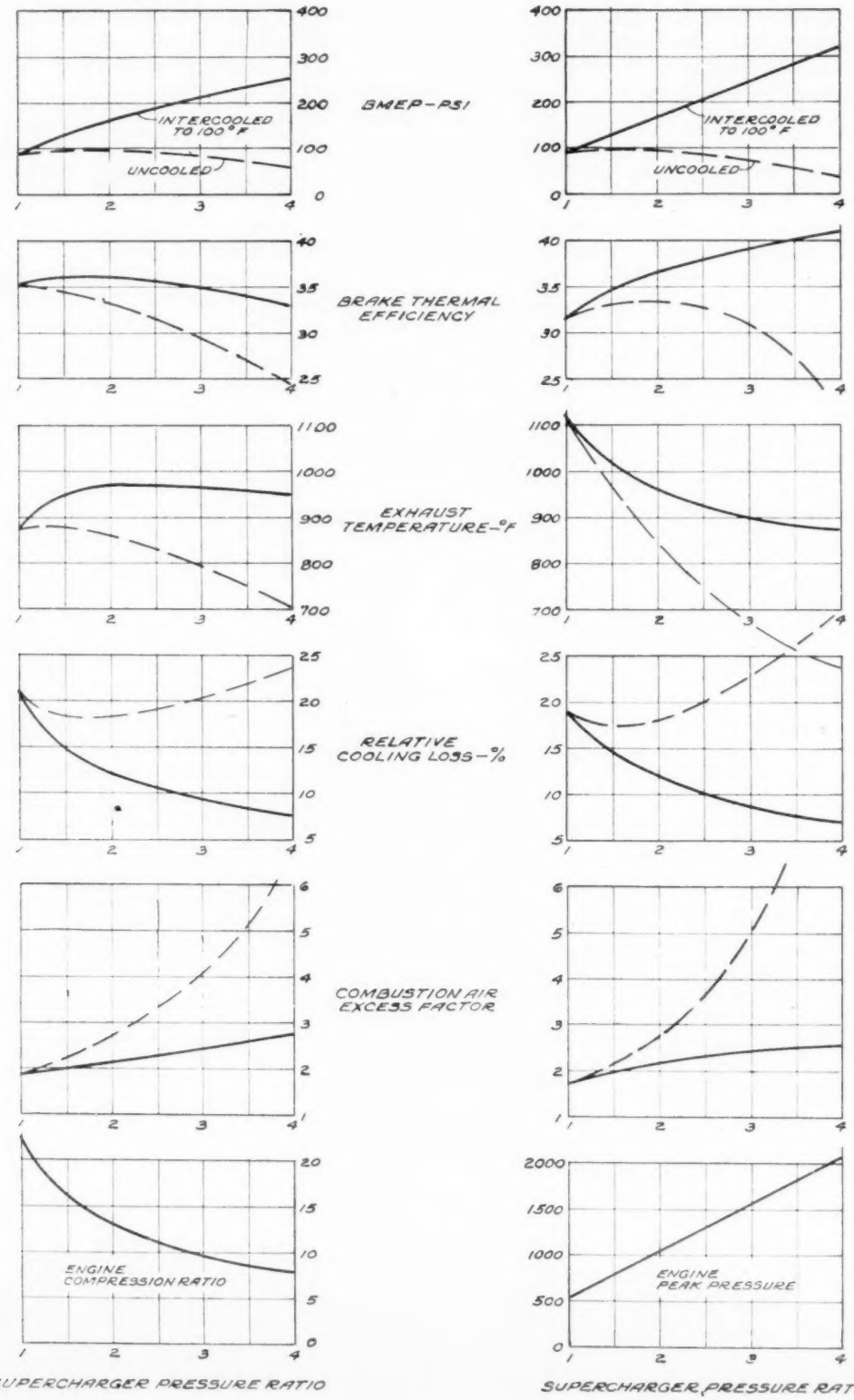
Fig. 6. Shown here, is the manifold with pulse converter used with the DeLaval turbocharger. The converter consists of the primary nozzles (1 and 1A), the mixing section (2), and the diffuser (3).

Diesel Engine Performance for Various Turbosupercharger Pressure Ratios

CONSTANT ABSOLUTE HEAT REJECTION
9.2 BTU/FT^3

CONSTANT ENGINE PEAK PRESSURE, 1000 PSI

CONSTANT ENGINE COMPRESSION RATIO, 13.5



Equation applicable for determining best transfer rates by convection. Total heat loss is found by integrating relationships over the full cycle.

$$Q = h\ A\ (t - t_w)$$

$$\text{where } h = c\frac{k}{l} Re^a\ Pr^b$$

At any instant,

Q = rate of heat transfer, Btu per sec
A = total heat transfer area, in^2
t = total gas temperature, °F
t_w = mean wall temperature, °F
h = convection heat transfer coefficient, Btu per sec per in^2 per °F
k = thermal conductivity of the gas, Btu per sec per in per °F
l = stroke, in
Re = Reynold's number (which involves mean piston speed, stroke, density and viscosity), dimensionless
Pr = Prandtl's number (which involves specific heat, viscosity, and thermal conductivity), dimensionless
a, b = experimental components
c = experimental coefficient

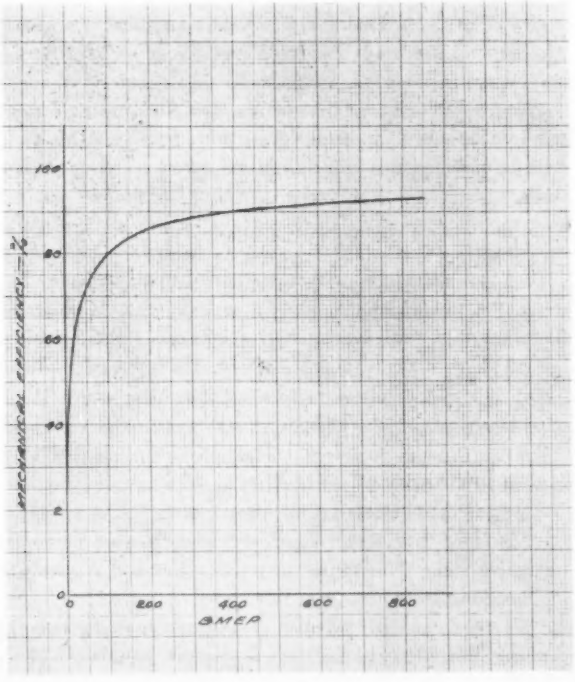


Fig. 8. It was assumed for purposes of theoretical study that mechanical efficiency of the engine varies with the bmep as shown at left.

with increasing supercharger pressure ratio is phenomenal. With intercooling, therefore, boost pressures can be raised to very high values, resulting in an ever increasing specific power output without increasing thermal loading.

Effects on the remainder of the engine operating variables can be seen from the curves.

Effect with Heat Rejection and Peak Pressures Maintained Constant

High peak pressures resulting from high supercharger pressure ratios at a fixed engine compression ratio can be avoided if the compression ratio is reduced commensurate with increasing supercharger pressure ratio.

To explore the effect of so varying the compression ratio that with any boost pressure peak engine pressure remains constant at 1000 psi, computations similar to those described were made to find the bmep, break thermal efficiency, exhaust temperature, relative cooling loss, combustion air excess factor, and engine compression ratio for both the uncooled and cooled cases—all under conditions of a constant absolute heat rejection of 9.2 Btu per cu ft of total cylinder volume.

Results of these computations are presented on the left in Fig. 7. Note that with the exception of thermal efficiency and exhaust temperature vs. supercharger pressure ratio, all other operating characteristics are generally quite similar to those for the case of constant compression ratio under conditions of constant heat rejection. Particularly, bmep is greatly increased if intercooling is used, and no gain in output is achieved without intercooling.

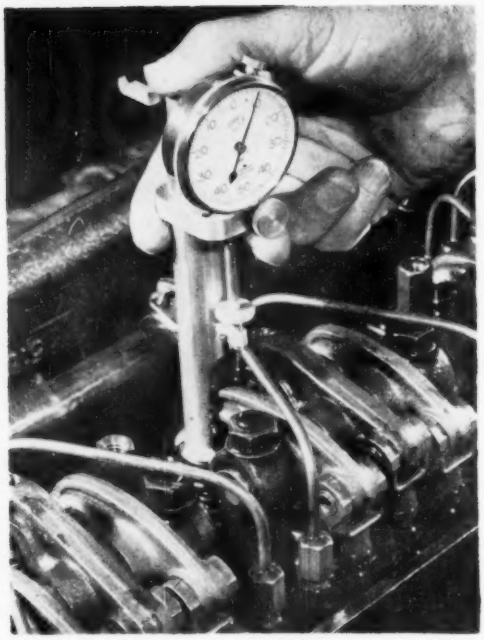
Conclusion

High-pressure supercharging offers the 4-cycle diesel engine manufacturer and user undreamed-of possibilities for improving engine performance. It offers improved fuel consumption and power outputs increased out of all proportion to the relatively slight increase in basic engine cost for the necessary high-efficiency turbocharger. Greatly increased power output is obtained without impairing engine durability, with only a negligible weight increase, and with virtually no overall dimensional increase.

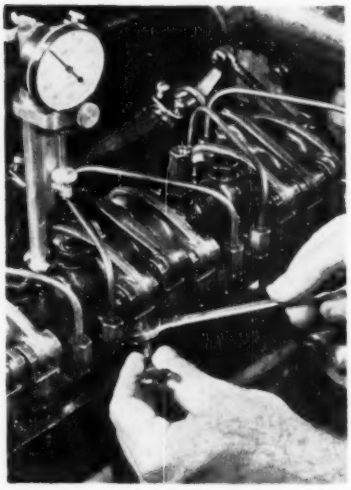
Taking advantage of these opportunities, insofar as the engine manufacturer is concerned, requires provision of an intercooler and in many instances does not involve basic engine modifications. By far the most difficult task falls to the lot of the turbocharger manufacturer, as we at De Laval can attest, in providing units capable of high pressure ratios and high compressor and turbine efficiencies.

Micrometer-Accurate Valve Settings

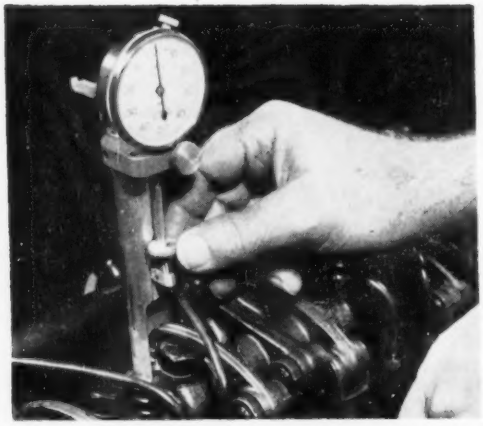
More accurate valve lash settings in less time is possible with a new tool—the P & G Valve-Gapper.



The Model 201 Valve-Gapper, designed for GM-71 Series engines, is mounted by resting the base on the valve keeper and hooking the bracket under the rocker arm. The engine is then positioned so that the associated cam follower is on the cam base circle (rocker arm tip fully up).



With pry removed, the indicator reads actual gap in thousandths of an inch. If incorrect, the service man has both hands free to make the necessary adjustments until dial reading is correct. The pushrod locknut can be tightened and any throwout can be immediately corrected.



With the tool positioned, rocker arm is pried upward until firm contact is made with the valve stem. The valve spring will resist motion and indicate contact. The micrometer dial is then adjusted to read zero or point of no lash.

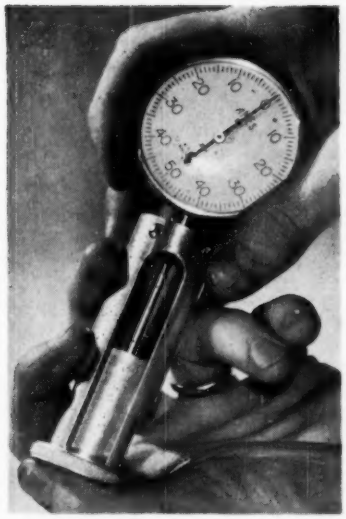
A NEW precision instrument, designed by a mechanic, makes the accurate lash setting of overhead valves a simple project. Settings are made visually and without any dependence on individual "feel" as is ordinarily the case when feeler gauges are used.

Accuracy and speed in setting valve clearances or gaps were never more important than they are today. Modern high-output engines leave little leeway if maximum performance is to be achieved and it is not necessary to elaborate on the value of "time" in today's maintenance operations.

Service men will like the simplicity and positive indication of accurate adjustment, as well as the freedom of both hands to handle the adjusting tools while making the settings. While primarily developed for setting valve gaps, other applications have been found for the tool all of which are aimed at better, faster tune-up procedures.

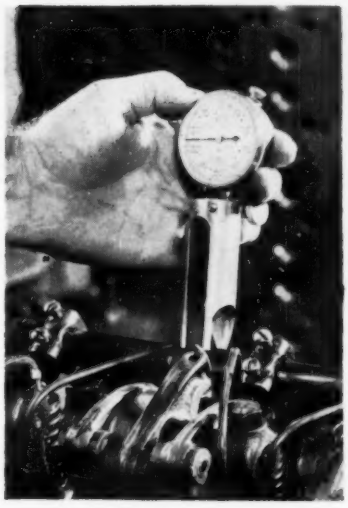
How the Gapper Works

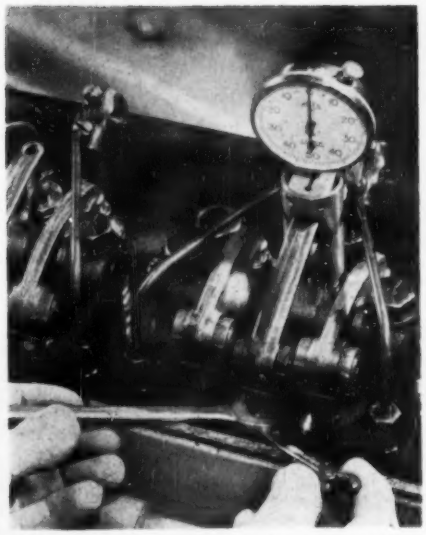
The principle employed by the gapper is to measure the travel of the valve rocker arm prior to contact with the valve stem. The actual travel is measured regardless of the condition of the rocker arm tip or valve stem. Travel is measured by a dial indicator calibrated in thousandths of an inch.



A micrometer plug gauge is used to preset the tool for injector timing. The plug gauge is machined so that one half is the proper height for 60mm injectors and the other half for 70mm, 80mm, or "M" injectors. Using proper height, the dial is set to indicate zero.

The timing tool is slipped over the rocker arm and injector follower guide and spring until the prongs rest securely on the injector body. When positioned, dial indicator stem bears on injector guide.





With the tool in place, both hands are free to adjust the pushrod until dial reads zero. Correct height, transferred from the plug gauge with the prongs and indicator stem as reference points, is set on the injector with micrometer precision.

In order to do this job, a supporting frame is needed. The general configuration is seen in the illustrations. With the cutout accommodating the rocker arm, the base of the tool rests on the valve keeper. The movable bracket in the tube hooks securely on the lower faces of the rocker arm. As the rocker arm moves toward the valve stem, the bracket moves with it until contact is made.

The bracket movement, indicative of the gap, is registered on the dial indicator. Once contact is made, the entire tool moves downward with the valve and there is no relative movement between tool body and bracket. In this way only the rocker arm travel prior to contact registers on the indicator and since the tool is held firmly in place, the service man's hands are free to make any necessary adjustments.

Since there is a dimensional variation in rocker arms and valve keepers for different engines, the tool must also vary. Models are available for diesel engines. The illustrations show the tool as built for the popular GM Series 71 engine and in the design, other uses where accuracy and the elimination of "feel" are important were incorporated.

Other Applications

GM Series 71 engines have two operations normally performed during tune-up that are largely dependent upon "feel" for accuracy. These are injector timing and, once the No. 1 control tube lever is properly positioned with respect to the governor, the setting of the remaining control tube levers. (For details see "GM Series "71" Engine Tune-up", October Diesel Power & Diesel Transportation). There is no departure from GM's recommended procedure; only the indication method differs.

"Timing" of the GM injector is the correct axial locating of the pump plunger in the barrel and is normally performed by using a timing tool to set the height of the injector follower guide above the injector body. In this case, the dial indicator is preset to read zero at the proper height using a micrometer plug gauge for the purpose. The timing attachment is placed over the injector and the injector rocker arm adjusted until the gauge reads zero again. Both hands are free to make a rapid and precise adjustment.

Setting the control tube levers is equally simple. The No. 1 control tube lever is set to the governor in the normal manner. The tool is then positioned between the injector control tube link pin and the cylinder head rim. Spring tension holds the tool in place and the No. 1 injector rack in full bottom position.

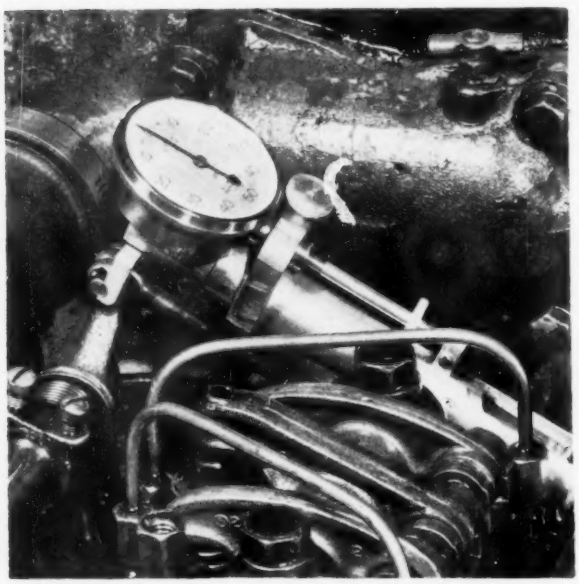
As the adjusting screws on each following control tube

lever are turned, the dial indicator will show when the associated rack is bottomed as any adjustment past this point will back off the No. 1 rack and change the dial reading. Working down the line, all rack settings can be perfectly matched to the No. 1 rack setting.

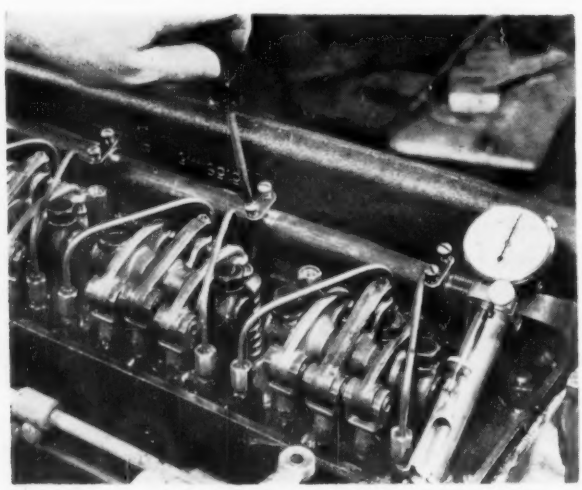
Summary

This new tool bears the same relationship to valve gap and other settings that the torque wrench does to bolt tensions. They both eliminate the inaccuracies inherent in "feel" and provide a uniformity of results that is much less dependent upon individual skill.

The Valve-Gapper offers a new approach to a procedure that has varied little since its inception. Also, as has been shown the tool is versatile. It can be a valuable asset in any shop and used to do jobs better and faster.



First step in matching the injector rack settings is to position the No. 1 control tube lever to the governor in the normal manner. The Valve-Gapper is then positioned with the hook bracket over the injector control tube lever link pin and against the cylinder head rim. Spring tension holds the tool in place with No. 1 rack bottomed.



Other control tube levers are set by turning the inner adjusting screw until the pointer moves about 0.0015-in. Then, tighten the outer adjusting screw until the pointer returns to zero without moving No. 1 rack. If the pointer does not return to zero, loosen the inner adjusting screw and retighten the outer screw. Repeat as necessary until the pointer just barely returns to zero.

What Do You Know!

Here are some questions to test your general knowledge of the diesel field. Make your selections, then turn to Page 119 to check them.

1. Approximately how many diesel engines of all sizes and types would you say were built in 1953?
   a. 100,000
   b. 125,000
   c. 150,000
   d. 175,000

2. It is possible to get a degree of supercharging without substantially increasing the pressure within the cylinder at the beginning of the compression stroke.
   a. True
   b. False

3. In a given engine there is a practical limit to the amount of turbocharging that is possible. Select the major governing factors from the list below.
   a. Thermal loading of the engine
   b. The mechanical efficiency of the engine
   c. Engine speed as it affects time for fuel injection
   d. Stress limits of engine components

4. So far, turbocharging has been confined to 4-cycle engines due to the relatively low bmep's of 2-cycle types and consequently the low level of energy in the exhaust, particularly at low and part-load operation.
   a. True
   b. False

5. What do you think is the expected life span of the average diesel-electric locomotive unit?
   a. 10 years
   b. 15 years
   c. 20 years
   d. unknown

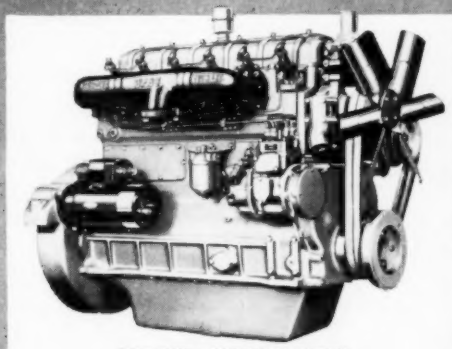
6. If you were setting up a maintenance project for a sizeable logging operation, which of the following arrangements would you select as most suitable?
   a. Reliance on commercial facilities for all work
   b. Complete centralized repair shop
   c. Commercial facilities for overhaul with spot repairs made in the field
   d. Centralized heavy repair shop with lighter repair at the work site

7. "Timing" as applied to the barrel and plunger assembly of the port-and-metering helix type of pump pertains to which of the following items?
   a. Setting the actuating cam in proper reference to the engine crankshaft
   b. Setting the plunger in the proper axial location with respect to the port
   c. Setting of the control rack in proper relation to the plunger pinion

WAUKESHA

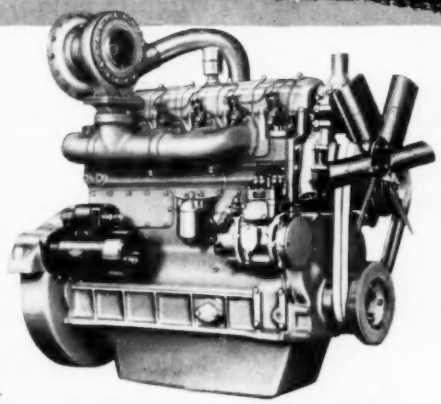
PAYLOAD POWER PLANT

Diesel - 135 Series - *Gasoline*



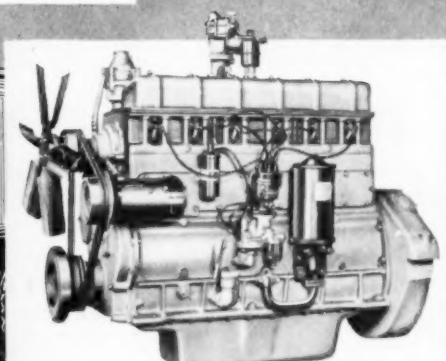
135-DKB—NORMAL DIESEL
426 cu. in. Max. hp 147 @ 2800 rpm.

FAST
SMOOTH
POWERFUL



135-DKBS—TURBOCHARGED DIESEL
426 cu. in. Max. hp 185 @ 2800 rpm.

SEND FOR BULLETINS



135-GKB and 135-GZB—GASOLINE
426 and 451 cu. in. Max. hp 147 and 153 @ 2800 rpm.

214

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS. • NEW YORK • TULSA • LOS ANGELES

Straight from the Tool Box

This is YOUR Department. Pass along your ideas to the other fellow. Send items to the Editor, preferably with a picture or sketch. Contributors will receive $10.00 for each item upon publication.

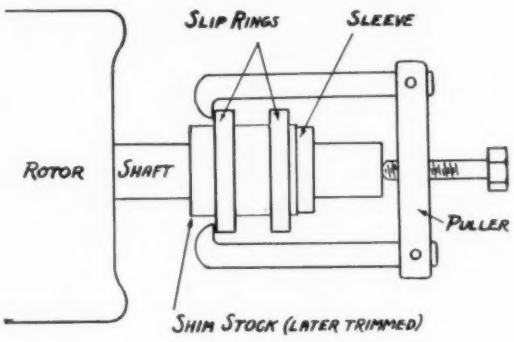
Arctic Expedients

G. U. Craik, Manitoba, Canada—While working in the Northwest Territories and northern Manitoba, I ran across an idea that might benefit someone who is forced to assemble small parts in the bitter cold. It is simply this: If you have a quantity of cap screws, bolts, etc., that must be handled with bare hands, put them in a small pail and get them thoroughly hot.

You can use an oven, the top of a stove, or use a torch. The bolts will hold this heat for a considerable time, especially if you wrap the pail with paper. This way, you avoid getting frostbitten fingers from handling frozen bolts and if you want you can warm your hands by holding them in the pail.

Another idea concerns Cummins-Westinghouse portable generating units. For some reason, possibly the variation from intense cold to operating temperature, the generator slip rings mounted on a fiber sleeve on the alternator shaft came loose.

I pushed the steel rings right off the fiber sleeve on the inboard side. Next, I wrapped some shim stock around the fiber sleeve and then used a puller to force the two rings back onto the sleeve over the shim stock. A sharp knife was used to trim away the excess shim stock. The rings gave no trouble thereafter.



Brrrr—Guess we never had it so good, here in a warm office. The heated pail solves the bolt problem, but how about the other parts? If small enough they might go in the pail too. As to the shrinking of the fiber sleeve, it is not unusual in cold climates. Not only is there thermal shrinkage, but cold-weather experts tell us that Arctic humidity is comparable to desert air. Kiln-dried wood in a bowling alley in Alaska continued to shrink, check, and warp until replacement along with building humidification was found to be the answer. Other materials act similarly—Editor

Gasket and Valve Ideas

C. Ingersoll, C & L Diesel Repairs, Coachella, Calif. —I have a couple of ideas that might help someone. One is about putting gaskets on pressed-steel valve covers such as on Caterpillars. Put No. 1 Permatex on the lip of the valve cover and set the cork gasket in it. There is a new cement out that will hold the gasket in position in about 3-min setting time. When the cover is set on the head, you will have a smooth flat sealing surface that won't leak. You can take the cover off several times and still get a good seal.

The second idea concerns stripping heads on these engines. A quick way is to take a tube like a deep socket or wrist pin about 4-in long and with a ID larger than the valve keeper circle. Set the tube on the retainer and give it a sharp rap with a hammer. The keepers or locks will "pop" out inside the tube. That's all there is to it and it is a real timesaver.

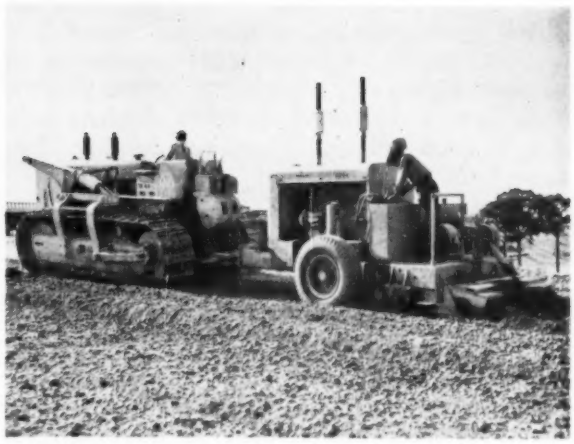
This seems to be the month for duplex ideas. Also, gasket hints keep cropping up (we have more on hand) showing that these simple though important items are more of a service problem than one might expect. We have seen the trick of "popping" valve keepers from their seats used, and with a little practice it is an exceptionally fast way of doing the job. But watch it; carelessness or heavy-handedness can do damage—Editor

news of our industry

Mixing Fill in Miami

A new and faster method of mixing layers of fill to prevent pavement damage due to uneven settling is being used by R. H. Wright and Sons, Uleta, Fla., on their contract to modernize seven miles of Route 9 at the northern outskirts of Miami.

Using an International TD-4 crawler tractor for tow, the fill is mixed in 6-ft widths to a 12-ft depth by a Woods Pulvi-Mixer, powered by an International UD-24 diesel engine. In placing fill for the two 100-ft approaches to a cloverleaf, where the route crosses U. S. 441 and the Seaboard Airline Railroad tracks, the mixer took only one-half hour to cover each approach one time. Previous mixing methods took 10 hours. In addition to fill mixing, the unit is being used to mix sub-grade and base for all seven miles of the mall-divided 4-line pavement.



Hauling Cane in Hawaii

In the tropical Hawaiian Islands, diesel power has been adapted to the use of the sugar cane growers. A Honolulu machinery dealer, Theo. H. Davies & Co., Ltd., fabricated a 28-ton capacity cane wagon, hitched it up to a 2-wheeled, rubber-tired Caterpillar DW21 tractor, and took it on a tour of the islands to demonstrate its utility on the plantations.

During most of the demonstrations, the big cane hauler has been working two 8-hour shifts a day. An average one-way haul is about four miles and the unit carries an average of 28 tons of cane at slightly over 20 mph. Approximately six loads per shift has been carried at a fuel consumption of four gallons an hour.

The wagon was built around the parts of two Caterpillar hauling units, incorporating the gooseneck and hydraulic steering assembly of a No. 21 scraper and the entire rear axle and wheel assembly of a W20 wagon. To speed the haul cycle, a chain net unload system was integrated into the wagon.

The most important advantage of constructing the unit in this manner is that all jack-knifing characteristics are eliminated. With the hydraulic steering unit, a positive steering action is possible, which makes traction available on both wheels at all times while turning. Under muddy conditions, this characteristic makes the unit easier to operate.

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new literature . . . . . page 100

organizational news . . . . . page 102

Railroad Hotbox Study

Eighty per cent of hotboxes are said to be caused by failure of oil-saturated waste to keep axles properly lubricated. The axles get red hot, break, and may cause accidents. Karl Klinger, consulting engineer of Roth Rubber Co., in a talk before the recent ASME convention in New York, described a new approach to this problem.

He applied some of the thinking used in inking printing press rollers which is a similar problem—that of consistently applying a liquid to a smooth rotating steel shaft. In this case, oil is applied to the bearing surface of a car axle.

The new system has three parts: the lubricator that rolls oil onto the axle; a rubber dust guard that fits the oil tight, but not friction-tight on the axle; and a rubber seal for the journal box lid. This system was first displayed at the railroad convention in Atlantic City and was viewed with interest by many railroad men. Since then, the results of field tests are said to look promising.

Malaya Armors Diesel Railcars

Contract has been made with D. Wickham & Co., Ltd. of England for the supply of 42 armored diesel railcars to be used on police duty in Malaya. The patrol cars have diesel-mechanical transmission utilizing a Perkins P6 52-bhp diesel engine and a Ford 4-speed industrial-type gearbox.

Power from the engine is transmitted through the gearbox to a 2-direction bevel-type rear axle with a sliding-dog direction engagement. A cardan shaft drives the 19½-in diam fan from the front end of the engine, which together with the radiator is of Leyland design. A 3½-gal capacity water header tank and a centrifugal-type steam trap incorporate the cooling system. A by-pass arrangement enables air to be drawn either from the body of the vehicle by the engine fan or by normal induction through the floor.

Driving controls are duplicated to provide easy operation in either direction. The driver's instrument panel is also duplicated. Brakes are air-pressure operated on all four wheels. Armor plating is 6-mm thick. The cars are 16 ft-long, 10-ft, 10-in high, and 7 ft, 7½-in wide. Overall weight is just under 6½ tons.

Sebewaing Votes New Engine

From time to time in this magazine, report has been made concerning the power situation in Sebewaing, Mich. This village has operated its own municipal power plant for 42 years. It needed more power and the Council proceeded with negotiations to finance the purchase of a new engine.

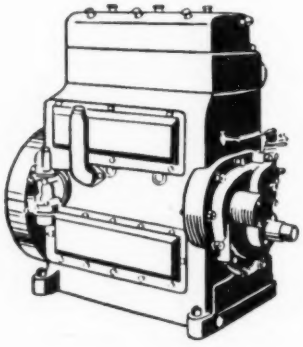
A nearby private utility with power to sell entered the picture, and a local industry obtained an injunction blocking negotiations. A legal battle ensued, the outcome of which was to require a special election whereby the voters could pass on the proposition of issuing a mortgage revenue bond to finance the needed improvement and refinance the remaining debt on an engine purchased earlier.

The result was a record turnout of

BUKH Diesel

Built in one, two or three cylinder units, BUKH engines are conservatively rated from 6 to 30 bhp for continuous duty. Equipped with either unique patented cartridge starter, manual or electric starter, efficient mechanical governor and dependable Bosch fuel system, the BUKH assures you of instant, reliable, low-cost power.

There is a BUKH 4-cycle full diesel tailored to suit your requirements for marine or land, stationary or mobile power. Fifty years of diesel experience is behind their outstanding dependability and economy.



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new revolutionary design . . . made expressly for field service

CORROSION-PROOF MECHANISM.
LIGHT WEIGHT ALUMINUM CASE.
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EASILY INTERCHANGEABLE—
SWIVELS 360° ON TWO PLANES.
LARGE FUEL CAPACITY—10 MICRONS
PRECISION FILTERS—KIENE PATENTED
DIAPHRAM TYPE VALVES.
FLEXIBLE AND RIGID PUMP CONNECTIONS

No Bolts — No Clamps

CONNECTOR SET KIT
makes convenient connection of test pump to most popular makes and models of diesel engines. Fixtures for testing Cummins and General Motors engines available.

Kiene Portable Hydraulic Test Pump is an entirely new and different product for the Diesel Industry — with features never before available in the field of injection and hydraulic repair and servicing tools. It offers all operating advantages of existing pumps and introduces many new features. No bolts or clamps required for leverage—to operate you simply use squeezing action on hand lever.

Write for Descriptive Bulletin KTP-50

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

Sebewaing voters who voted 9 to 2 in favor of issuance of the bonds and thereby the expansion of their municipal power plant. This vote of confidence must be heartening to the plant superintendent, Harold Wagner, and the Village Council.

Perhaps what is more important than this vote of confidence in their elected officials and expression of desire to keep their municipal power plant, is the people's demonstration of the validity of the principle of self-determination—a principle our country is defending all over the world. Even in the face of what might be termed "undue pressure", the people showed by their vote that they wanted and meant to have their plant. That's the American way.

Tool Grinding Hint

Use of a lapped or superfinished cemented carbide cutting tool during roughing operations in machining steel is a waste of time according to the Carboloy Dept. of the General Electric Co. The surface finish on a carbide tool tip has little effect on tool life for average machining on steel. During roughing operations, it is pointed out, carbide tools perform satisfactorily whether ground on a diamond or silicon carbide wheel, or even if left with the surface in as-sintered condition.

Surface finishes obtainable for as-sintered carbide tools provide 30 plus micro inches. Those ground on silicon carbide grinding wheels provide 15 plus micro inches, diamond grinding wheels 8 to 15 micro inches, and lapping and superfinishing reduce to 0.5 to 5 micro inches.

Tests indicated that a lapped or superfinished tool fails more rapidly in making roughing cuts than one ground on a diamond wheel because the lapped surface over which the chip slides offers more area contact, increasing both rate of heat transfer from chip to tool tip and friction due to sliding. A slightly rougher surface offers less contact and operates at lower temperatures.

Tools employed for finishing and precision finishing aluminum, magnesium, etc., must have a good surface finish and lapping of the top face and cutting edges is a must for good tool life. For operation on steel, it is necessary to finish grind cutting edges with a diamond wheel. Long-run jobs using quick-change tool holders require use of a duplicating type of grinder to control uniformity of the tool shape. These often use a 400-grit resinoid-bonded diamond wheel but very little stock is removed since it is more of a truing-up operation. Rough grinding of precision finish tools may be done by off-hand grinding with a 100-grit silicon carbide or diamond wheel.

Towmotor Charters Danish Firm

Towmotor Corp., manufacturer of fork lift trucks and industrial tractors, has signed a contract with Brodene Vestergaard of Copenhagen, Denmark, giving it production and distribution facilities in the Scandanavian countries and continental Europe. The Danish organization is a manufacturer and distributor of industrial supplies in Europe.

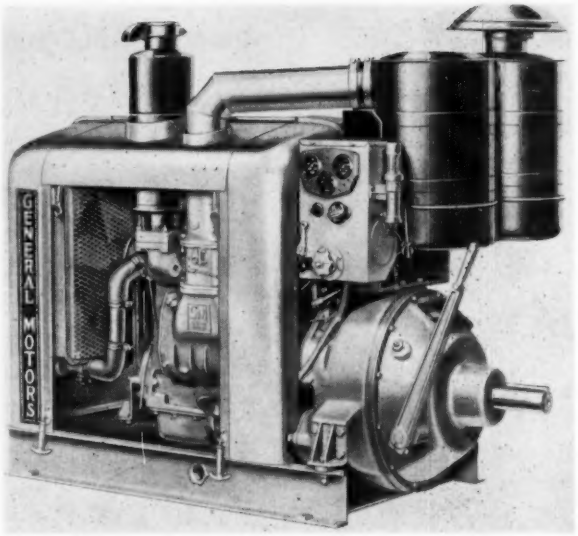
(*Continued on page* 107)

new products

Lightweight Power Package

Detroit Diesel Engine Div., General Motors Corp., 13400 W. Outer Drive, Detroit 28, Mich., has added to its line a new diesel power package developing 76 bhp at 2500 rpm and weighing only 1450 lb. The engine is one of the division's "4-51" models and is said to be especially adaptable for use in rock crushers, small shovels, air compressors, pumps, and other construction equipment where power in a compact package is desired.

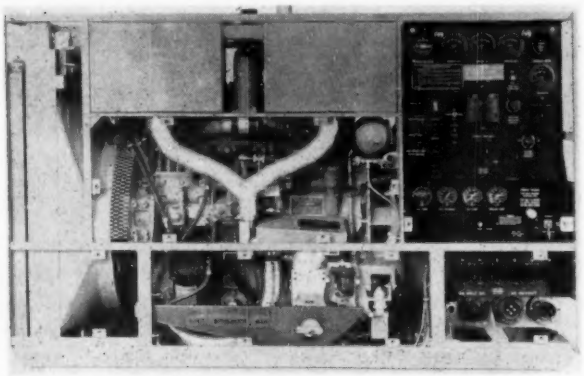
Like other Detroit diesels, the engine is of 2-cycle design with a Roots-type blower. It is a "square" engine with bore and stroke measuring 4.1-in and has four cylinders arranged in line. Compression ratio is 18:1; starting is pushbutton, automotive-type electrical. Valves are eliminated by use of intake and exhaust ports in the cylinder liners. Other design features include a pneumatic-type governor having no rotating parts, and a lubricating oil pump built around the crankshaft to eliminate need for gear or chain drive.



Diesel Powers Generator Set

Hercules Motors Corp. announces that its Model DIX6-D, 6-cyl diesel engine has been selected to power the O'Keefe and Merritt PU-211/G diesel-generator set, claimed to be the lightest weight 20-kw generating unit in production. Designed to operate efficiently in temperatures ranging from -65°F to 131°F and to perform properly from sea level up to 6500-ft altitudes, it is capable of 25-kw continuous output.

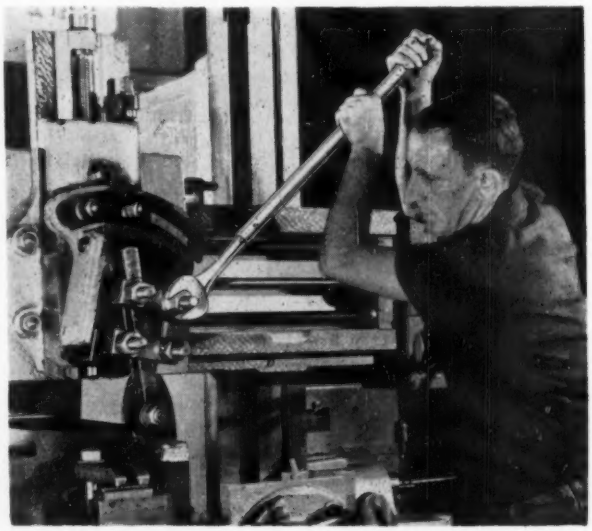
A 24-hour day service life with only normal maintenance for a 105-day period is reported. To facilitate minor repairs and adjustments, all engine accessories except starter are mounted on the left side of the unit.



Heavy-Duty Open-End Wrenches

Snap-On Tools Corp., Kenosha, Wis., is making available a new line of heavy-duty open-end wrenches that are used with detachable tubular handles. The series consists of 10 wrenches in a size range of 7/8-in to 1½-in. Three different length handles which fit two or more sizes of wrenches are all that are needed to operate the complete series.

The wrenches have been designed for heavy nut turning, especially on jobs where box-type wrenches cannot be used or are too slow and inconvenient. On most applications a wrench can be used to run down a nut in a hurry and then the tubular handle is attached to give increased leverage for final tightening. Wrench heads are set at a 15-deg angle to the handle so that nuts can be turned with only a 30-deg movement when space is restricted. The tubular handles can also be used with straight and offset "boxockets" that are also available.



Deep-Drilling Engine for Oil Industry

A powerful V-12, valve-in-head, engine for use in the petroleum industry, wherever heavy sustained loads are encountered, has been added to the line of the Le Roi Co., 1706 S. 68 St., Milwaukee 14, Wis. Known as the L4000, it has 4000 cu in piston displacement and develops 635 hp at 1200 rpm with accessories. It burns low cost natural gas and can also be equipped to burn LPG, sewer gas, or gasoline.

A sister unit to the L3460, the new engine has been designed for operations where dependable power must be delivered at minimum operating and maintenance costs. It is equipped with removable wet-type cylinder sleeves and individual cylinder heads are removable without disrupting intake and exhaust manifolds.

Heavy-Duty Truck for Construction Work

To fill the need for a fast, highly maneuverable, heavy-duty truck in quarry and construction work, Dart Truck Co., Kansas City, Mo., has added Model 10-S to its line, utilizing many of the features found on its larger trucks. To assure high speed with full load, it is powered by a 6-cyl, 4-cycle, Continental RD6572, 156-hp diesel of 4¾-in bore and 5⅜-in stroke. This is claimed to give it the highest horsepower rating of any comparable truck in its class.

Maneuverability in close quarters is said to have been provided by designing the truck on a 100-in wheel base, giving it a turning radius of less than 20 ft. Six rock lug-type tires are each the same size to make switching possible. A twin 6-in diam double-acting, single-stage hoist raises up to a 60-deg dumping angle.

Alkaline Wash for Railroad Equipment

A mild alkaline cleaner, Composition No. 72, for washing railroad equipment, has been announced by Oakite Products, Inc., 157 Rector St., New York 6, N.Y. It is said to dissolve readily in hot or cold water and to rinse freely, and is recommended for use at between 2 to 6 oz per gal of water. It also may be heated to 145°F.

The manufacturers suggest that the surface to be cleaned be first wet down with a pressure spray, after which the solution is applied by brush, automatic washer, or foam spray unit. They state that this solution eliminates problems that arise from solvent saturation of wire coverings and insulation and that it is safe for both operators and equipment. It is not recommended for varnished surfaces, however.

Automatic Braking for Fork Trucks

A new fork truck automatic braking feature has been developed by the Yale & Towne Mfg. Co., Philadelphia, Pa., available as optional equipment on the company's trucks. It is so designed that the seat rises instantly causing the parking brake to be applied when the operator leaves his truck. In addition, a time delay relay permits the engine to idle for three minutes before automatically shutting it off. This gives the operator time to return without having to restart the engine.

Although WESTON provides sensing elements of various forms for special applications, the element in all standard WESTON Industrial Thermometers is a *multiple helix* as illustrated above. Why the more costly *multiple,* instead of the single, helix? *Just one reason.* WESTON's twenty years' experience producing bi-metal thermometers for industry has furnished convincing proof that the shorter, non-sagging *multiple* helix provides better accuracy, over longer periods. And while it provides other advantages, the one thing most thermometer buyers demand is long-term dependability. You get it, in extra measure, in WESTON Thermometers with *multiple* helix. WESTON Electrical Instrument Corp., 614 Frelinghuysen Avenue, Newark 5, N. J.

WESTON *Thermometers*

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"ENGINE INSURANCE"

Sharples Centrifugal Oil Purifiers keep lubricating and fuel oils free of all contaminants such as water, sludge, tank scale, and entrained dirt—continuously, and at minimum cost, without harm to any additives that may be present in the oil.

this protection saves you money three ways:

1 ***higher engine efficiency***

2 ***less wear on moving parts***

3 ***longer periods between engine overhaul.***

Sharples Oil Purifiers with the simple tubular bowl take only 10 minutes to clean, and are built for tough continuous service.

For peak purifying efficiency, at minimum operating cost, you can depend on Sharples.

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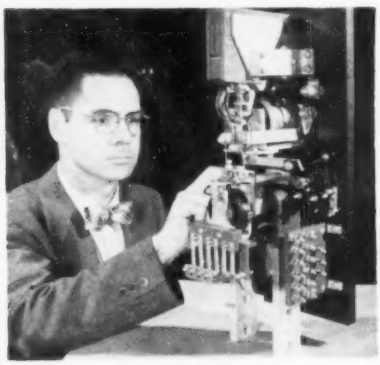
Associated Companies and Representatives throughout the World

Relay Prevents Flashovers

When a short circuit occurs in the traction-motor circuit of a diesel-electric locomotive, the current from the main generator rises at a rate of approximately 500,000 amps per sec. If this rise continues unchecked, the commutator flashes over, often causing extensive damage to the generator.

To prevent this, a race results between the rapidly rising current and the protective relay (impulse relay) that senses the current rise and acts to remove excitation from the generator field either before flashover or quickly thereafter so that extensive damage is prevented. A relay de-



signed by Westinghouse Electric Corp., Pittsburgh 30, Pa., to accomplish this, and the contactor associated with it, are both old as components but new in combination.

Laboratory tests undertaken by the company reveal that the relay provides good protection to a generator. When the generator was short-circuited repeatedly at its maximum voltage, the resulting flashes caused minor and superficial damage to brushholders and the ends of the commutator bars, it is claimed. Without the relay, one short circuit and resulting flash under similar conditions caused sufficient damage to require extensive cleaning of the brushholders and commutator bars and replacement of the string band and some brushholder insulators.

Manual Electrode Holder

Tweco Products Co., Wichita 1, Kan., announces a 400-amp electrode holder, weighing just 27 oz, and designed to handle electrodes through 5/16 in. Designated Model A-516, it

will hold rods as small as 3/32-in in diameter.

The holder features air vent between holder castings and insulation, allowing for heat from the arc which is absorbed by the castings to be dispelled through the ducts. A large diameter handle that has only point contact with the casting permits a free flow of air to keep the holder cool. A wedge-shaped upper jaw provides maximum pressure with minimum contact area.

Insulation Resistance Tester

A compact Vibrotest Model 272, providing portable insulation resistance measuring for checking circuits of equipment designed for high voltage operation, is being manufactured by Associated Research, Inc., 3758 W. Belmont Ave., Chicago 18, Ill. It features nine ranges of resistance values from 0.1 to 50,000 megohms at DC test potentials of 500, 1250 and 2500 volts, and is line powered from 115-v, 50-60 cycle source.

In addition to "read" position, a panel mounted selector switch permits operator to bypass output resistor to make full output of 4 milliamps available to more quickly charge high capacity circuits. After reading, operator turns selector switch to "discharge" position, which de-energizes circuit under test and protects him from any capacitive discharge from test circuit. Other features include transformer, guard circuit to eliminate surface leakage effects, and an electronic amplifying circuit for high sensitivity. Weight of the unit is 23 lb.

Miniature Torus Seals

The D. S. D. Mfg. Co., 2694 Whitney Ave., Hamden, Conn., announces development of miniature torus seals designed to meet demand for an extreme temperature (−1.50°F to 1000°F) high-pressure corrosion-resistant seal.

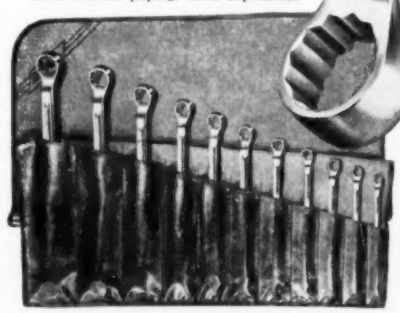
The seals are manufactured from 1/32-in diam stainless steel tubing with a .005 wall in sizes ranging from 3/8-in to 1-in OD. They are for use in small lines and are adaptable to bolt heads, flanges, rivets, etc.

(*Continued on page* 108)

on job after job...
YOU'LL FIND
* Snap-on
BOXOCKETS
the handiest, safest, fastest wrenches you have ever used

Put *speed* on the job . . . with Snap-on Boxockets . . . far stronger and many times safer than open end or adjustable wrenches! Offset heads provide ample clearance in tight places. Double hexagon openings completely encircle the nut—grip securely on all six corners—cannot slip—cannot spread—and require only half the turning space where movement is limited. Each Boxocket provides two wrench sizes in each handle. Complete series covers full range of sizes, 3/8" to 1 5/8". Other types—Midget, Dwarf, Heavy Duty and Sledge—5/16" to 4 5/8". Write for Industrial Catalog and General Catalog of 4,000 Snap-on tools for production and maintenance.

XV-611-K OFFSET BOXOCKET SET—Consists of 11 wrenches, range 3/8" to 1 1/4", in handy kit bag. Provides 22 wrench sizes with six popular sizes duplicated.



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SERVES INDUSTRY EVERYWHERE THROUGH THESE 42 FACTORY BRANCH WAREHOUSES

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Brooklyn, N. Y., SLocum 6-8707
Buffalo, N. Y., GArfield 6374
Charlotte, N. C., 3-8831
Chicago, Ill., TAylor 9-2651
Cincinnati, Ohio, WOodburn 3188
Cleveland, Ohio, PRospect 4400
Dallas, Texas, RIverside 1611
Denver, Colo., ALpine 5406-07
Detroit, Mich., TRinity 5-6455
Fargo, N. Dakota, 5790
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Omaha, Nebr., JAckson 6159
Philadelphia, Pa., POplar 5-7400-01
Pittsburgh, Pa., MOntrose 7600
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Seattle, Wash., CApitol 3646
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SNAP-ON TOOLS CORPORATION
8064-A 28th Ave. • Kenosha, Wisconsin

*Snap-on is the trademark of Snap-on Tools Corporation

new literature

Service Tool Guide

Kent-Moore Organization, Inc., 5-105 General Motors Bldg., Detroit 2, Mich., has just released a new service tool guide for all GMC diesel and gasoline trucks, both light and heavy duty.

The 52-page illustrated book contains descriptions of tools and their applications that are recommended for every operation designed to help the service man find the tool to do any job in the shortest time with the least effort. Special sections include: front and rear axle, cab and body, brakes, clutch, cooling, steering, transmission, and shop equipment.

Oil Filter Elements

Engine Life Products Corp., El Monte, Cal., has issued a 124-page catalog on its lube and oil filter elements for engines.

Sixteen introductory pages are devoted to descriptive and pictorial presentations of construction, design, maintenance factors and other features of the elements. The major bulk of the catalog is then given over to cross reference tables of filters for industrial, marine, military, agricultural, automotive and laboratory engines.

Gauge Protection

Sprague Engineering & Sales Corp., 1144 W. 135 St., Gardena, Cal., has published a bulletin on its S-214 series of automatic shut-off valves for protection of gauges and instrument in hydraulic or pneumatic systems against overloads, for pressure ranges from 10 to 5000 psi. Specifications and complete adjustment and installation details are given.

Gambling with Safety

The accompanying photograph is a scene from a new film on safe operation of construction machinery, "The Gamblers", released by Caterpillar Tractor Co., Peoria 8, Ill. The operator of the tractor-scraper forgot to close the pet cock on the air supply tanks for his brakes. When he met this car at an intersection, he didn't have any brakes.

"The Gamblers" documents typical scenes on any construction job where an operator may get careless, a new approach from the usual "how to do it safely" films. It demonstrates how accidents happen and the fatal

"AMOT" THERMOSTAT

"Performance without trouble" is the reason more engine manufacturers, pipe lines, power plants, oil companies and shipyards are using AMOT as standard for automatic engine water and oil temperature control. AMOT thermostats offer the following advantages:

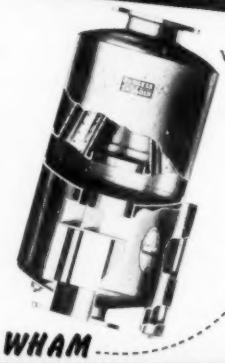
1. Large capacity combined with light weight.
2. Excellent reliability even under extreme shocks and vibration.
3. No external bulbs or tubing to break and cause trouble.
4. Temperature is fixed and cannot be tampered with by operator.
5. Holds close regulation and is not sensitive to pressure.
6. Operating forces are very large and with no packing glands there is no chance of valve ever sticking or becoming inoperative.
7. Because of its simple and rugged construction, practically no maintenance is ever required.
8. Has positive 3-way valve action in which full pump capacity flows through the engine at all times.
9. Compact in size and will operate in any position, which facilitates piping.
10. Available in pipe sizes up to 6" for all types of gas and diesel engines.

Write for catalog and name of your nearest AMOT representative.

AMERICAN MOTORS CO.
RICHMOND · CALIFORNIA

QUIET THOSE DIESELS
STOP SPARK DANGER

with BURGESS-MANNING Spark Arrester EXHAUST SNUBBERS



to a Whisper

Noiseless, smoother, safer operation are prime specifications of every Burgess-Manning Marine Snubber. Every one is engineered to the specific problem of maximum engine performance of completely dissipating the energy of exhaust gas slugs — therefore, quiet efficiency.

Every one is built to render lasting satisfaction under severest conditions. There are no obligations for recommendations—send us a description of your problem.

From a WHAM

BURGESS-MANNING COMPANY
751 East Park Avenue, Libertyville, Illinois

For FUEL TRANSFER and HYDRAULIC GOVERNOR Service

TUTHILL

MODEL L PUMPS

ARE PERFORMANCE-PROVED

Throughout the diesel industry, Tuthill Model L pumps are recognized for their dependability in fuel transfer and hydraulic governor service. Model L is a mechanically-sealed, positive displacement internal-gear rotary pump, assuring quiet, leak-free operation with low power consumption. Capacities from .33 to 6 g.p.m. in wide pressure ranges. Available as single or double-pump units. Write for Catalog No. 101 including Pump Guide for diesel applications.

TUTHILL PUMP COMPANY

Dependable Rotary Pumps since 1927

939 East 95th Street, Chicago 19, Ill.

Canadian Affiliate: Ingersoll Machine & Tool Company, Ltd., Ingersoll, Ontario, Canada

"FIXED-READING"

PREMAX

MODEL YRF

ENGINE PRESSURE INDICATOR

for DIRECT-READING of COMPRESSION and FIRING PRESSURES OF EVERY TYPE OF DIESEL ENGINE

ONE OF THE FEATURES Responsible for Its Overwhelming Preference by Leading Diesel Manufacturers and Operators

Successive readings may be taken rapidly since no venting of the instrument is required between readings. No closing of valves required to change from firing pressure to compression pressure reading.

For other features, write for Bulletin 294

ACCURATE PRESSURE READINGS as high as 1700 P.S.I.

BACHARACH

INDUSTRIAL INSTRUMENT CO.

7301 PENN AVENUE • PITTSBURGH 8, PA.

results that may come of carelessness.

The film had its premier showing before the construction section of the National Safety Council at its recent Congress in Chicago. The 20-min film was produced by the Calvin Co. of Kansas City, Mo., and can be seen by contacting any Caterpillar dealer.

Arc Welding Tools

Tweco Products Co., Wichita, Kan., has released a 12-page catalog covering its complete line of electrode holders, ground clamps, cable connectors, and cable accessories for arc welding. Full information on the line is contained, including consumer quantity prices.

Cooling System Conditioners

Special service bulletins covering installation and maintenance instructions on the Perry cooling system filter and conditioner have been issued by a number of engine manufacturers. This is a simple unit that is claimed to retard and generally eliminate pitting and corrosion of cylinder liners, blocks, water pump impellers, radiator parts and other components on the wet side of cooling systems.

Most cooling system troubles are said to be caused by acid water, hard water scale deposits, rust, erosion, sediment, and other impurities. The Perry system, when properly installed, is said to protect the cooling system in five ways.

It filters out any particles of foreign matter which may be in the coolant itself. It softens the water and prevents hard deposits which insulate engine passages and destroy the cooling system's ability to carry away excess heat. Buffering agents control the coolant's chemical condition so that it is neither too acid nor alkaline for safe operation. Corrosion-protection of the bulk of the cooling system surface is achieved by a thin film of rust-inhibiting chemical. Electro-chemical action prevents pitting where tiny breaks in this film are present.

Application data has been published by the following engine builders in their maintenance literature: Buda, Cummins, General Motors (Detroit), International Harvester, Mack, and Waukesha. Full particulars are available from The Perry Co., Division of R. M. Hollingshead Co., Camden, N. J.

Portable Power on Safari

When Commander Attilio Gatti, famous African explorer and movie producer, set out on his latest expedition to Africa, he carried his own portable power equipment with him. D. W. Onan & Sons Inc., Minneapolis 14, Minn., has issued a 28-page booklet written by the commander describing the expedition, illustrated with photos taken on the trip.

A total of four Onan power plants were taken on the expedition, capable of generating more than 35,000 watts of city-type electricity. The booklet illustrates the importance of diesels for portable power in out of way places. A 16-mm movie of the expedition is also available free for group showings.

(*Continued on page* 109)

organizational news

Brown Boveri Adds Specialist

Walter H. Leeman has joined the New York office of the Brown Boveri Corp. as a specialist in the field of turbocharging.

Mr. Leeman was born and educated in Switzerland. He first joined Brown Boveri in 1949 and came to the United States in 1951 to take up graduate studies at the Georgia Institute of Technology. In 1952, he entered the Elliott Co.

Walter H. Leeman

Elliott District Manager

Raymond V. Thayer has been appointed Cincinnati district manager for the Elliott Co. He joined the company in 1945 as a field engineer in the Cincinnati office following his discharge from the army.

Fairbanks-Morse Promotion

Donald L. Harwood has been appointed to the post of general purchasing agent of Fairbanks, Morse & Co., with headquarters in Chicago.

Mr. Harwood has been with the company since 1926, starting at its Three River works, and has come up through the ranks of the purchasing department. In 1951, he was transferred to Beloit, Wis., where he has been manager of materials and schedules.

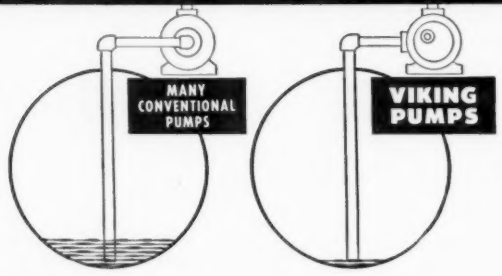
GM Retirement

O. F. Brookmeyer, a pioneer in the establishment of train propulsion by internal combustion engines on American rails, has retired from the Electro-Motive Div. of General Motors.

Before joining EMD, Mr. Brookmeyer was with the Big Four Railroad and was superintendent of transportation at Indianapolis. He was instrumental in the application

O. F. Brookmeyer

GETTING TO THE BOTTOM OF THINGS



The difference to you between profit and loss can depend upon the simple, positive action of Viking Rotary Pumps. Their fast, thorough stripping action can mean that you get all you pay for when emptying barrels, tanks and other containers instead of leaving a part of each load. Where many other pumps fail, efficient stripping is possible with Vikings because of the suction lift created by our famous Viking "gear-within-a-gear" pumping principle.

Whether the liquid you want to pump is thick or thin, you will pump more . . . faster with a Viking.

What is your pumping problem? Send it along today and ask for bulletin 54SD.

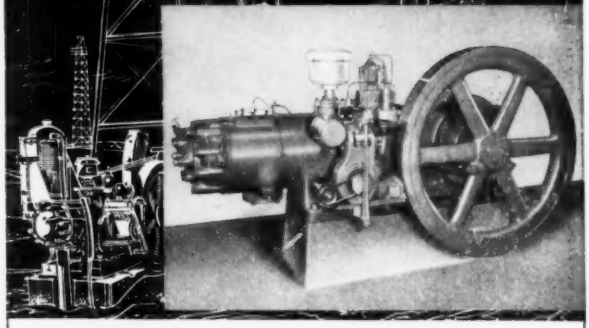
VIKING AN HONORED NAME IN PUMPING

See Our Catalog in SWEET'S

VIKING PUMP COMPANY CEDAR FALLS, IOWA

For low-cost power rely on

LORAIN Multi-Fuel ENGINES



55 HP Lorain Model DA with gasoline starter

. . . full line from 10 to 55 HP

Lorain diesel or gas engines are built with an extra margin of stamina to stand up to gruelling service. Simple 2-cycle, single-cylinder design reduces moving parts for dependability. They operate as cold-starting diesels or can be converted easily and quickly in the field for natural gas or butane.

Get full details on Lorain Multi-Fuel Engines. *They operate longer without attention . . . operate longer between overhauls.* Write for specifications today.

A-5973

WHITE-ROTH *Machine Corp.* LORAIN, OHIO

PIERCE

CENTRIFUGAL governors
give you exact R.P.M. control
.... at
LOWER
COST

For more than 40 years Pierce has specialized in the speed control field. Pierce *Centrifugal* Governors, engineered specifically for your Diesels, give accurate, dependable control of engine RPM to meet the varying conditions of any job. Pierce Governors are standard equipment on many of America's finest diesel engines . . . assuring maximum protection, dependable performance—at lower initial and maintenance cost. Replacement governors and parts are available through your local distributor or fuel injection service station.

For distributor's name or information on special governing problems, write

PIERCE

the PIERCE GOVERNOR CO., Inc.

1614 Ohio Avenue, Anderson, Indiana

"WORLD'S MOST EXPERIENCED GOVERNOR MANUFACTURER"

G&K DIESEL SERVICE

Offers at LARGE SAVINGS

INTERCHANGEABLE
FACTORY NEW
FIELD TESTED
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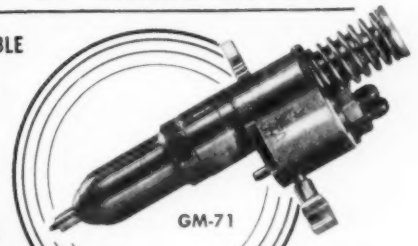
WORLD
FAMOUS

"FERA"

Imported From Italy



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INJECTOR EXCHANGE with NO-RE-WORKED PARTS USED

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12 ATLANTIC AVE.
BOSTON, MASS.

of the internal combustion engine to standard train propulsion. More than 700 EMD rail cars were sold under his direction before the diesel locomotive was presented to the railroads. He also directed the sales aspect of the introduction of diesel motive power on the railroads by EMD.

Exide Executives Promoted

The promotion of three executives in its recently formed industrial products division has been announced by The Electric Storage Battery Co.

C. J. Moore, former manager of railway and motive power sales, has been appointed industrial products sales manager. W. E. Nyce has been named manufacturing manager and L. E. Wells, former chief engineer, has been made director of research and engineering. The experience of the three in the storage battery industry totals almost 100 years. Mr. Nyce has been with the company 41 years, Mr. Wells over 36, and Mr. Moore 18.

V. E. Rennix

G. W. Rukgaber

C. L. Moss

A. O. Meyer

EMD Elevations

The Electro-Motive Div. of General Motors announces the promotion of four managers.

Victor E. Rennix becomes general sales manager. George W. Rukgaber is the new regional manager, Chicago. Charles L. Moss is now regional manager, Jacksonville. A. O. Meyer has been transferred to industrial sales engineer from his post of regional manager, Jacksonville.

Mr. Rennix worked for Baldwin Locomotive from 1921 until 1942 when he went to Washington to serve on the War Production Board. In 1944, he joined EMD as district sales manager in Chicago and in 1946 was promoted to regional sales manager.

Mr. Rukgaber, district sales manager in Chicago since 1948, was manager of the GM "Train of Tomorrow" from 1946 until his transfer to EMD as district sales representative in Chicago, in 1948.

Mr. Moss has been district sales manager in New York since 1951. He joined EMD in 1936, was promoted to district engineer in Chicago and then district engineer at Washington, D. C. He became assistant field manager in New York in 1945 and sales representative, Washington, in 1947.

Mr. Meyers joined Delco-Remy Div. in 1927. He served in various engineering and manufacturing capacities with other divisions and

joined EMD as manager of the industrial engine section in 1942, became Washington representative, and was made manager of the demonstration section of the sales department. In 1947, he returned to Washington as district sales manager and became regional manager at Jacksonville in 1952.

Battelle Appointment

Thomas L. Sherman, noted for his work in development of diesel engines, has accepted a consulting assignment with Battelle Institute and will work with its mechanical engineering division.

Formerly employed as a consulting engineer by Fairbanks, Morse & Co., Mr. Sherman comes to the research center with more than 35 years of experience in the mechanical engineering field, both in this country and abroad. Earlier, he was chief engineer of the diesel engine division of the Steel Products Engineering Co., in charge of its engine development for the Navy.

C. W. Schwendener

F. A. Abben

R. Benton

Flexonics Elevates Three

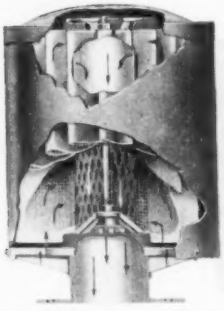
Flexonics Corp. announces three organizational changes. Carl W. Schwendener has been appointed factory manager of the Elgin division. Fred A. Abben is the new industrial relations manager; and Richard Benton has become factory manager at Rock Falls, Ill.

Mr. Schwendener joined the company in 1943 and has been personnel director for the past five years. Mr. Abben joined in 1946 and was formerly factory manager of the company's Savanna, Ill. division. He will assume personnel responsibilities formerly carried by Mr. Schwendener. Mr. Benton has risen from stock clerk since associating with the company in 1940 and has served in various supervisory positions, most recently having been production manager at the Elgin division.

New Worthington Manager

Worthington Corp. announces the promotion of John R. Hamill to the post of manager of the Kansas City district office. He succeeds Paul J. Foley who has been appointed general sales manager for the company's Plainfield, N. J. works.

Mr. Hamill joined the company in 1937. After assignments as estimator in the oil field product division at



MODEL D Intake Filter

STAYNEW DRY TYPE INTAKE FILTERS NEED NO SERVICING!

Only Staynew Intake Filters have the ability to remove air-borne particles without the necessity of viscous filter aids. The *dry-type* filtering medium becomes even more efficient as it accumulates dust. Resistance increases very slowly with use. Staynew filters frequently operate two or more years without attention. When cleaning is indicated, a brush or simple vacuum tool is all you need. There are no oil reservoirs to clean and refill—no oil coatings to renew.

Write today for Intake Filter Bulletin 100

Representatives in principal cities

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

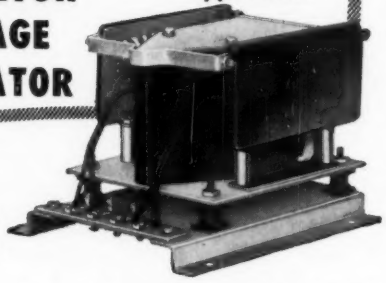
DOLLINGER CORPORATION

10 Centre Park • Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

Burlington TYPE WA Formerly Ward-Leonard Type 5660

GENERATOR VOLTAGE REGULATOR



FEATURES

- DIRECT ACTING
- FAST RESPONSE
- AUTOMATIC CONTROL
- SMALL, COMPACT SELF CONTAINED
- RUGGED CONSTRUCTION
- RHEOSTATIC ACTION
- INEXPENSIVE

Designed for use in regulating the voltage of A.C. generators for Stationary, Mobile or Marine installations. Direct rheostatic action provides a simple, effective and automatic means of regulating voltage by performing the function of an automatic field rheostat.

Rating of rheostatic element is 2 amperes maximum exciter shunt field current at rated load and power factor. Maximum sigma watts is 50 watts.

Inquiries for complete information and engineering services solicited.

B BURLINGTON INSTRUMENT COMPANY

121 Third Street, Burlington, Iowa

Harrison and sales engineer at Buffalo, he was appointed Gulf Coast manager of the marine division in 1944. From 1950 until the present, he has served as manager of Worthington's Wilmington branch office.

Worthington Engineer Honored

Paul Diserens, consulting engineer, and until 1952, director of research and development of the Worthington Corp., was honored at a testimonial luncheon upon the occasion of his retirement in the forty-fifth year of his service to Worthington.

Mr. Diserens, a former engineering faculty member of the University of Illinois, joined the corporation in 1909 as engineer of test in

Paul Diserens

charge of research at its Cincinnati works. He moved to New York in 1919 as assistant chief engineer and became chief consulting engineer in 1928. In 1945, he became director of research and development.

Among engineering developments on which Mr. Diserens worked was the feather valve for high-speed air and gas compressors. He was also responsible for various developments in connection with high pressure compressors for the Navy.

Alco Changes

An organizational change attributed to increased sales and production of two of its operating divisions was announced by American Locomotive Co. A. T. Lawrance has been appointed regional sales manager for the Alco Products Div. with headquarters in Houston. Charles H. Homer, Jr. has been named manager of the Beaumont Iron works.

Mr. Lawrance had been both southwestern sales manager and manager of the Beaumont works. In his new capacity, he will supervise sales of the Alco Products line as well as the Beaumont line in a sales territory extending from the Mississippi to the West Coast and north to Oklahoma. He has been associated with the Products Div. in a sales engineering capacity since 1931.

Mr. Homer will be in charge of all manufacturing of Beaumont and in addition will have responsibility for purchasing, accounting and industrial relations. He joined the works in 1938 as a metallurgist and became plant superintendent in 1947. Two years later, he was transferred to Dunkirk, N. Y. as chief of quality control engineering for the Alco Products Div. He returned to Beaumont in 1952 as product manager of heat transfer equipment.

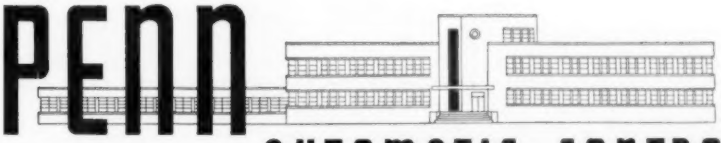
Cuno Sales Representative

Cuno Engineering Corp. has appointed the Jameson Co. of St. Louis as its industrial sales representative of that district. Mr. Jameson served as technical advisor to the Navy on Cuno filters during the war and since then has been a sales engineer with the home office.

THIS can happen to your engine
WATER TEMPERATURE TOO HIGH!
OIL PRESSURE FAILURE
...and so can this!
that's why your ENGINE NEEDS THIS...

PENN SAFETY CONTROL

The first hint of overheated cooling water or lube oil pressure failure snaps the Penn Control into action. It will sound an alarm, flash a warning light, or stop engine operation . . . *whichever you choose.* Then, you can investigate and correct the minor trouble *before* serious damage occurs. Learn more about this *low-cost* protection. Write **Penn Controls, Inc., Goshen, Indiana.** Export Division: 13 E. 40th Street, New York 16, N. Y., U.S.A. In Canada: Penn Controls Limited, Toronto, Ontario.



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on all Your Forging
Requirements

Quality Precision Crankshafts
For Diesels — Since 1910 . . .

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MACHINE FORGINGS
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DIESEL USERS AGREE

that for Completely Dependable
Automatic Lubrication,
it's
Manzel
FORCE FEED
LUBRICATORS

Manzel
DIVISION OF FRONTIER INDUSTRIES
271 BABCOCK STREET, BUFFALO 10, N. Y.

Aeroquip Advances Executive

Aeroquip Corp. announces the appointment of Matthew J. Betley as vice president and general manager. He joined the corporation in 1952 and has been vice president—manufacturing, since February 1953.

Matthew J. Betley

Mr. Betley will be responsible for sales, engineering, financial, and manufacturing functions of the company, including management of three subsidiaries: Aeroquip, Inc.; Aero-Coupling Corp.; and Elbeeco, Inc.

Gar Wood Reorganizes Mattoon

Gar Wood Industries, Inc. announces the formation of the Mattoon Div. to handle the production of bulldozers and road machinery sold through Allis-Chalmers industrial tractor dealers. Hunter Dietz, formerly plant manager at Mattoon, Ill., has been appointed the new division manager.

Penn Controls Chief Engineer

William Few has been appointed chief engineer of Penn Controls, Inc. He will be responsible for the company's expanded research and product development program.

Mr. Few comes to Penn from the Clark Controller Co. where he was

William Few

manager of the electronic and allied products division. He had begun his career at General Electric when he was selected for their two-year student engineering training course. In 1940 he joined Clark where he remained until his present appointment.

news of our industry

Welding Restores Crankshafts

Reclamation of crankshafts by a process of controlled welding is being done commercially by a Charlotte, N. C. firm. The American Crankshaft Co. reports that the process was under development for five years, 1943-1948. Since that time, they say that they have reclaimed over 50,000 crankshafts of various types, including those for diesels. "Arcplated" is the term used to describe the reconditioned crankshafts.

In reclaiming worn crankshafts by this method, the first step is to determine by inspection whether or not they are suitable for reclamation. Next, the shafts are hard-surfaced with a wear- and corrosion-resistant steel by automatic submerged electric welding (apparently a form of shielded arc welding). Typical of welds, there is a fusion of the metals and thus the company is able to guarantee that the weld deposition never flakes or loosens.

Following this, shafts are heat-treated, stress-relieved, and shot-peened. They are then ground to standard size or to any desired undersize, and polished. Static or dynamic balance is checked and if necessary, corrected. Finished shafts are rust-proofed and boxed.

According to the company, shafts are available on an exchange or outright purchase basis, each carrying the usual new shaft guarantees.

Diesel Study at High School

A course to train apprentices in diesel and gas engine repair and maintenance has been instituted at Burgard High School in Buffalo, N. Y. Two classes now in session have been launched by three locals of the International Union of Operating Engineers, with more classes expected to be started once the initial ones have been completed.

Major goal in the school program is to educate apprentices in the field of engineering to the more recent developments of major engine builders so that they will be better equipped to meet engineering advances.

(*Continued on page* 110)

with **NUGENT**

LUBE OIL FILTERS

THE motor vessel Gaetano S. has had her troubles with lube oil filtering. But they all ended on November 1, 1952.

On that day a Nugent #4L strainer (FIG. 1554) was installed for full flow filtering of lube oil for the vessel's 8 cylinder. 350 H. P. Cooper-Bessemer diesel. A Nugent #4L disc type filter (FIG. 1555) and a #4S type were installed for by-pass.

By February 3, 1953, the vessel had logged 1250 hours of engine operation. At this time the filters were checked. The dirty recharge from the #4S weighed 18 lbs. 7 ozs. after draining. When new it weighs 6 lbs. The #4L weighed 30 lbs. When new it weighs 10½ lbs. A total of 21 lbs. of dirt and carbon were prevented from reaching vital engine parts in five months time.

This is the type of protection that any diesel needs—on land or on sea. Write for complete information on a Nugent filtering system to meet your needs.

NUGENT TRADE MARK

Wm. W. Nugent & Co., Inc.

417 N. Hermitage Ave. CHICAGO 22, ILLINOIS

Established 1897

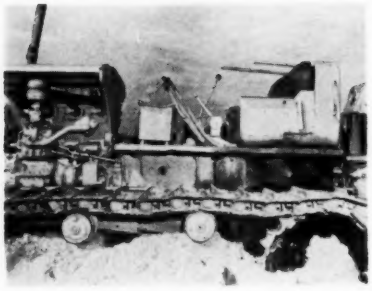
OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

Representatives in Boston • Cincinnati • Detroit • Houston • La Junta, Colo. • Los Angeles Minneapolis • New Orleans • New York • Philadelphia • Portland, Ore. • San Francisco Seattle • St. Louis • Tulsa • Representatives in Canada: Montreal • Toronto • Vancouver

new products

New Throttle Control

Introduction of a positive-action, friction-type throttle control designed to improve performance of gas- or diesel-powered equipment has been announced by the Link-Belt Speeder Corp., Cedar Rapids, Iowa. The control, said to provide a large range of engine speeds, can be used on shovels and other construction machinery, tractors, marine engines, crushers, and drilling rigs.



Once set, the throttle control is claimed to hold speed constant, despite vibrations encountered. Control is said to be easily mounted in the field with no adjustment necessary to compensate for engine size or type. It will stay put in any position with any governor pull up to 75 lb and elimination of ratchets and pawls is said to keep wear down.

Nickel-Cadmium Battery

Commercial availability of a new sintered-plate, nickel-cadmium battery was recently announced by Sonotone Corp., commonly identified with the manufacture of hearing aids and other electronic devices. They have been producing the batteries for four years, turning out some 600,000, all for classified military service.

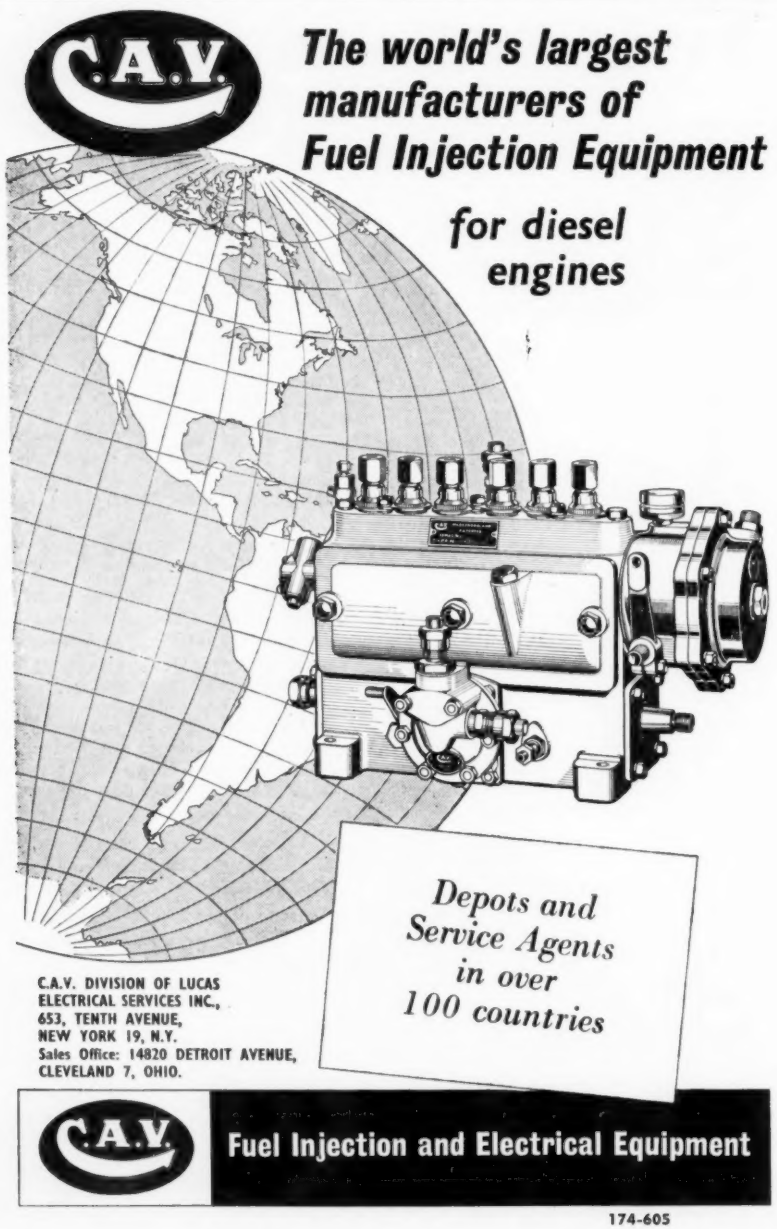
The company's application of the sintered-plate principle to nickel-cadmium batteries was spurred when it obtained data on discoveries in Germany during World War II. Anticipating commercial demands, many specialized, in excess of the capacity of its three plants. Sonotone has granted two licenses, one being to the American Bosch Corp.

Extremely long life and great resistance to abuse, both physical and operational, is characteristic of nickel-cadmium batteries. These features are retained in the new type, and because of the special plate construction, others are added. Plates start as a nickel-wire mesh screen on which nickel powder is sintered. This porous structure is filled, electro-chemically, by either cadmium hydroxide or nickel hydroxide.

These active materials produce the negative and positive plates, respectively. Plastic, sandwiched between fabric sheets, forms the separators. A 30 per cent solution (by weight) of potassium hydroxide in distilled water is the electrolyte.

Large active areas are produced along with close plate-spacing. This produces a very small unit with low internal resistance permitting high current discharge rates as required for severe cranking needs. High charging rates are also possible and the batteries can be left completely discharged without damage. Operation temperature range is given as from -65°F to 165°F. The battery will operate in any position and neither gassing nor loss of water present any problem.

(*Continued on page* 112)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The world's largest manufacturers of Fuel Injection Equipment
for diesel engines
Depots and Service Agents in over 100 countries
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Sales Office: 14820 DETROIT AVENUE, CLEVELAND 7, OHIO.
C.A.V.
Fuel Injection and Electrical Equipment
174-605

new literature

Ignition of Diesel Fuels

One phase of government sponsored research on the properties of combustible fuels is described in a report available from the Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. Entitled "The Spontaneous Ignition Properties of Some Diesel Fuels and Pure Hydrocarbons", it discusses the properties of several fuels studied and through a variety of experiments, discloses the close relationship between their ignition and their composition.

To further the understanding of this relationship, the report includes delineation of the limits of ignition with respect to temperature and oxygen pressures. Curves are plotted to explain ignition behavior, oxygen percentages, and non-ignition conditions as related to various temperatures and to show intensity of flames of pure hydrocarbons and other combustible materials. Conclusions clarify the effect of fuel compositions on spontaneous combustion of diesel fuels, pure hydrocarbons, peroxides and hydroperoxides.

Power Plant Cleaning

A 42-page handbook, "How to Make Power Plant Cleaning Easier", has been issued by Oakite Products, Inc., 157 Rector St., New York 6, N. Y.

Divided into sections for each type of power plant, the booklet gives methods and solution concentrations and temperatures used for each job. Drawings and photographs of methods and equipment illustrate the text. Index is included for reference.

Calculating Laplace Transforms

The National Bureau of Standards, Office of Scientific Publications, Washington 25, D. C., has published "Tables of Coefficients for the Numerical Calculation of Laplace Transforms", 36-pages, selling for 25 cents.

The tables presented serve to facilitate the numerical evaluation of infinite integrals expressible in the form of Laplace transforms such as arise in the theory of heat condition and in various branches of electrical engineering. Applications and illustrations of the various uses of the volume are given and a schedule of the explicit expressions of the Lagrange interpolation coefficients is provided.

Precipitator Booklet

The Permutit Co., 330 W. 42 St., New York 36, N. Y., has prepared a 20-page booklet describing the applications, principles of operation, design features, flow diagrams, and specifications of its precipitator in its three basic designs.

According to the manufacturer, the unit offers an efficient means of removing impurities from a liquid by precipitation, adsorption, settling, and filtration. It is said to require less space, chemicals, and reaction time than previous designs.

(*Continued on page* 113)

Precision Rebuilding for DIESEL-TRUCK-BUS

SPECIAL DESIGN MACHINERY

EXPERIENCED WORKMEN

ENGINEERING KNOW-HOW

CONNECTING RODS
are remanufactured to original Factory Standards and Tolerances.

TRANSMISSION SHAFTS
are hard chrome surfaced and ground to original specifications.

ALL PARTS MAGNAFLUX INSPECTED

Write for Prices

PRECISION REBUILDING

CLEVELAND HONE & MFG. CO.
8816 HARKNESS RD., CLEVELAND 6, OHIO
Serving the Nation's Largest Fleets

news of our industry

Clinchfield RR Washes Tunnels

After more than 40 years of service on the Clinchfield Railroad, the steam locomotive has left its powdery remains behind to hamper the diesel which has entirely supplanted it in through service. Excessive engine filter and ring maintenance was encountered on the diesel locomotives and an investigation was launched.

It was discovered that most of the abrasive material getting into the filters was being dislodged from accumulations on the surfaces of the line's 55 tunnels, totaling 9.7 miles in length. Crown sections of the bores were coated with deposits of soot, sand dust and fly ash from 1- to 3-in thick. Horizontal crevices on rock walls of unlined sections were filled.

Generally, the diesel locomotives go through the tunnels under full power or under full dynamic braking. The air from the fans as well as currents created by the train's passage dislodged the dirt and part of it got through the filters into the engines.

Clinchfield officials decided to remove the dirt in order to reduce the amount of maintenance required from this condition. A work train was made up, powered by a diesel locomotive, and the tunnels were washed by spray cars. Chesapeake & Ohio Railway Co. representatives went along to observe the operation since their road also contains many tunnels.

Clinchfield engineers estimate that at least 3.4 per cent greater engine piston-ring life should be realized as a result of the tunnel-cleaning. In one year, this would exceed the cost of the washing operation. Any further increase in ring-life expectancy would reflect a net saving, not including filter benefits derived.

FILTERS MAY LOOK ALIKE

But ONLY Genuine

Luber-finer PACKS

Give the Results Enjoyed by MILLIONS OF SATISFIED USERS THE WORLD OVER

IT'S WHAT'S INSIDE THAT COUNTS

The Efficiency of LUBER-FINER'S Patented Process HAS NEVER BEEN EQUALLED!

DON'T BE MISLED BY PRICE ALONE!

There is NO substitute for DIESELPAK'S Patented Filtering Process for H. D. Compounded oils AT ANY PRICE. The DIESELPAK cleans more oil faster—keeps it CLEAN longer—and gives more service and better engineered protection than any other filtering element. It PAYS to get the BEST!

✓ PROTECTS ENGINE

The DIESELPAK is designed to remove not only ABRASIVES but also CONTAMINANTS such as moisture, carbon, acid, etc. from oil, and is engineered to keep the filtering media and the removed contaminants from migrating back into engine. The DIESELPAK assures continuous protection that reduces engine wear and maintenance costs far beyond that possible with other types of filter elements.

✓ EXTENDS PERIODS BETWEEN DRAINS

The DIESELPAK collects and holds even the most finely dispersed contaminants without affecting or removing compound additives from the oil. A glance at the dip stick will show that the oil is CLEANER—symbol of better lubrication and longer oil life enjoyed only by Luber-finer users.

✓ TAKES LESS OIL

The DIESELPAK because of its engineered construction requires 2 to 4 quarts less oil than spongy substitute filter elements being offered for use in the Luber-finer housing. This is an additional saving enjoyed when using the DIESELPAK.

STANDARD of the INDUSTRY SINCE 1936

Since Luber-finer was first introduced to the public in 1936, it has gained worldwide acceptance by millions of satisfied users everywhere. Luber-finers are approved by major oil companies and petroleum engineers. Luber-finers are standard or optional equipment on America's foremost stationary engines, diesel trucks, tractors and earth-moving machinery.

LUBER-FINER PACKS AVAILABLE:

1. ***REFINING PACK***—Introduced to the public in 1935 for use with straight mineral oils, fuel oils and inhibited industrial oils.
2. ***DIESELPAK***—First made available in 1941, the DIESELPAK was primarily designed for use with H. D. detergent compounded oils under the direction of Dr. Ulric B. Bray, B.S., Ph.D., F.A.I.C., internationally known Petroleum Chemist. The DIESELPAK has also achieved outstanding results when used with fuel oils and straight mineral oils.

GET THE FACTS FREE!

Why take chances with expensive equipment? WRITE TODAY for complete information on what to look for before you buy either Filters or Replacement Packs—see how you can save many dollars and hours in maintenance.

LUBER-FINER, INC., 2510 S. Grand Ave., Los Angeles 7

Increasing Plunger Wear-Life

Utilizing a new method of "remanufacture", Midwest Diesel Service, claims it is able to drastically cut plunger and bushing replacement cost and increase their wear-life as much as 300 per cent. They have found, by actual wear tests in the field, that 90 per cent of the wear occurs on the plunger.

A process that increases the hardness of the plunger by means of a patented hard chrome plate which Rockwells 30 points higher than the standard plunger, has been developed by them. A perfect plunger and bushing seal is said to be assured by the lapped fit of these parts and an operating clearance of 25 to 30 millionths of an inch is maintained for small diameter plungers, increasing proportionately for the larger sizes.

To acquaint users with their service, Midwest is offering to re-manufacture and ship four plungers and bushing free for 10 replacements sent them.

Fram Erects New Headquarters

Ground-clearing has been started on the 8-acre site of the new headquarters building of the Fram Corp. on Pawtucket Ave. in East Providence, R.I. Construction will begin

early this year. The new building will cost nearly $500,000 when completed this summer and will have a lightweight steel wall only 2-in thick with glass and porcelain covering.

Erection of the new headquarters building marks the 20th anniversary of Fram. The corporation has progressed from a small chemical laboratory to a world-wide filter organization, marketing its products throughout the U.S. and Canada, with licensed manufacturers in eight foreign countries.

Steamers Die, Bells Toll On

When the last of the iron horses pass from the American railroad scene, their memory will still be carried on in various sections of the country. All over the land, numerous congregations are now being summoned to worship by the pealing of the former locomotive bells.

The brass janglers are also being awarded by the Erie Railroad to high school groups as traveling trophies to winning football teams. And in Korea, a bell which once heralded the approach of a Rock Island steam locomotive is being used for chapel call by our troops in the Third Infantry Division.

C&O Workers Develop Own Diesel Repair Shop Plan

A planning job that management engineers had estimated would take as much as three years to draw up, was recently figured out in six weeks of their own time by 60 workers of the Chesapeake and Ohio Railway. The workers presented their plan, for converting the road's huge steam engine repair facility at Huntington, W. Va. into a new diesel repair shop, to the company's board of directors and had it approved.

The workers' ideas were presented to the directors in the form of a 3-dimensional, 255-sq ft working model by three of the builders—Charles Brandenburg, an electrician; Henry Fairburn, wheel shop foreman; and Hobart Ash, foreman of the sheet metal shop at Huntington. The men explained their ideas with the model, demonstrating where the machines should be placed and how the various components of the shop should be laid out.

The board then approved the spending of $1,400,000 to carry out the project, which is estimated will save the railroad $750,000 a year.

Walter J. Touhy, president of the road, was so impressed by the working model when it was brought to his attention that he decided it should be demonstrated directly to the directors. He indicated that conversion of the shop was part of an inside efficiency engineering program started by the company two years ago inviting employees to contribute ideas on more efficient operation.

Following the workers, presentation, Robert R. Young, chairman of the board, extended his thanks to the group who had drawn up the plan without the usual authorization. "This confirms the feeling I have had ever since I worked with labor myself," he said, "that men at the working level deserve as much of the credit as the officers of the line".

(*Continued on page* 114)

WHAT IS YOUR CLUTCH PROBLEM

There is no one stock answer to every power transmission control problem. That is why ROCKFORD clutch engineers can be of practical help in designing applications that will increase your product's efficiency — make substantial savings in cost — and reduce servicing downtime. Send a print or a description of your clutch need for their recommendations — based on many years of clutch application experience and the extensive ROCKFORD line of clutches, power take-offs and speed reducers.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

BW

ROCKFORD CLUTCH DIVISION
Borg-Warner
1301 Eighteenth Ave., Rockford, Illinois

ROCKFORD CLUTCHES

new products

LPG Blow Torch

Turner Brass Works, Sycamore, Ill., announces production of an LPG hand model blow torch with disposable fuel tank designed for solder and similar use where heavy-duty equipment is not required. It is compact in size to fit in tool box or pocket and no filling is said to be necessary since the entire fuel tank is replaced by a refill unit as needed.

Water-Recirculating Pump

An industrial pump with scoop rotor and rubber roller-type vanes, designed for production in bronze to meet continuous water recirculation requirements, has been developed by Hypro Engineering, Inc., 404 N. Washington Ave., Minneapolis 1, Minn.

Listed as Model 4300, the unit is engineered for continuous duty service through use of sealed, permanently lubricated ball bearings. A pressed fit of the shaft into the inner ball bearing race to restrict lateral movement of the rotor minimizes end thrust wear within the pump. The pump impeller is self-lubricated by water and will deliver approximately 7 gpm at 50-lb pressure and 1750 rpm. Pressure range is from 0 to 75 psi; recommended speeds to 1800 rpm. Net weight of unit is 14 lb.

Quad Ring Seal

Minnesota Rubber and Gasket Co., 3630 Wooddale Ave., Minneapolis 16, Minn., announces a new type of industrial gasket, called Quad ring, which it claims outperforms O rings in ability to resist spiral twisting and maintain a seal under high and low pressure and dynamic action.

The ring has four sealing surfaces as compared to the two of the O ring and is said to be completely interchangeable with the O ring, all grooved dimensions corresponding. The rings are produced in a complete line of sizes and are comparable to O rings in wall thickness and diameter.

Power Drive for Hand Tools

A new power drive designed for fast operation of hand pipe threaders, cutters and reamers has been announced by the Toledo Pipe Threading Machine Co., Toledo, Ohio. Capacity is ⅛-in to 2-in pipe, ¼-in to 1½-in bolts, with universal drive shaft, geared die stocks, and cutters up to 12-in. It is operated by a Universal ¼-hp motor, forward and reverse, 25 to 60 cycles, AC or DC from any 110-v light socket.

(*Continued on page* 117)

YOUR CONTROL PROBLEM IS MERCOID'S PROBLEM

WHEREVER CLOSE AND ACCURATE CONTROL IS REQUIRED FOR PRESSURE, TEMPERATURE, LIQUID LEVEL OR MECHANICAL MOVEMENT, THERE IS A MERCOID CONTROL AVAILABLE FOR THE JOB.

Type PPQ diaphragm differential pressure control operates from minute changes (.03" of water) in the difference between two pressures. Ranges available 6" vac. to 6" press., and 30" vac. to 30" pressure.

Type BB Differential pressure control for high pressures. Opens or closes a switch contact according to a change in the difference between two pressures. Available ranges 60 psi to 2500 psi.

Type DA-21 pressure control opens or closes an electrical circuit upon an increase or decrease of pressure. Can be furnished with many different circuit arrangements. Ranges available 0-14 psi. to 300-2500 psi.

Type DA-35 temperature control opens or closes an electrical circuit upon an increase or decrease of temperature. Various circuit arrangements also available. Ranges from 25-100 F. to 370-530 F.

Type DA-400 Series pressure controls incorporate a single bourdon tube which actuates two independently adjustable Mercoid magnet operated mercury switches to accomplish various circuit operations. Ranges 0-30 psi to 300-2500 psi.

Type 76KPE explosion-proof liquid level for pressures to 300 psi. Packless torque tube construction transmits float motion to two Mercoid mercury switches connected in series.

MERCOID CONTROLS ARE AVAILABLE IN EXPLOSION-PROOF OR WEATHER-PROOF ENCLOSURES

For further information write for Bulletin CA

THE MERCOID CORPORATION
4201 BELMONT AVE., CHICAGO 41, ILLINOIS, U.S.A.

ALL MERCURY SWITCH EQUIPPED AUTOMATIC CONTROLS

new literature

Flexible Metal Hose

Flexonics Corp., 1363 S. Third Ave., Maywood, Ill., has issued a 32-page illustrated catalog on its line of metal hose. It covers the full line of manufacture in Rex-Weld corrugated hose, Rex-Tube convoluted hose types, Rex-Weld stainless steel hose, and numerous special purpose asssemblies.

The catalog features a new Rex-Flex heavy-duty stainless steel hose. Coupling types and installation instructions are included. Photographs illustrate mountings in various applications.

Marvel Water Filters

Marvel Engineering Co., 625 W. Jackson Blvd., Chicago 6, Ill., has issued Catalog No. 300 explaining the adaptation of all models of its sump and line type filters for the filtration of oil, to water applications. No changes are said to have been made in the basic synclinal design. The catalog contains complete data on individual unit sizes available.

Logging and Rigging Manual

Hyster Co., 2902 N. E. Clackamas St., Portland 9, Ore., announces publication of a new logging, rigging, and land clearing tackle manual. The booklet illustrates various kinds of gear and tackle used in these operations with drawings and specifications of recommended rigging procedures.

Elliptical Venturi Tube

A 5-page brochure has been prepared by Simplex Valve & Meter Co., 68th and Upland Sts., Philadelphia 42, Pa., to describe its Type VE venturi tube, a primary device used to produce pressure differentials from flowing liquids for actuating rate of flow meters. The tube is constructed with an elliptical, in place of the conventional circular, throat design.

Pedestal Tool Grinder

South Bend Lathe, South Bend 22, Ind., has issued a 2-color folder describing its recently introduced 8- and 10-in pedestal tool grinders designed for easier off-hand grinding.

Tool grinders will be interested in the fact that there is no bulky grinder between the wheels, assuring ample working room. Motor is mounted inside the pedestal. Wheel spindle is set forward on the pedestal, also allowing for more work room and toe room. In addition, grinding wheels are wide set.

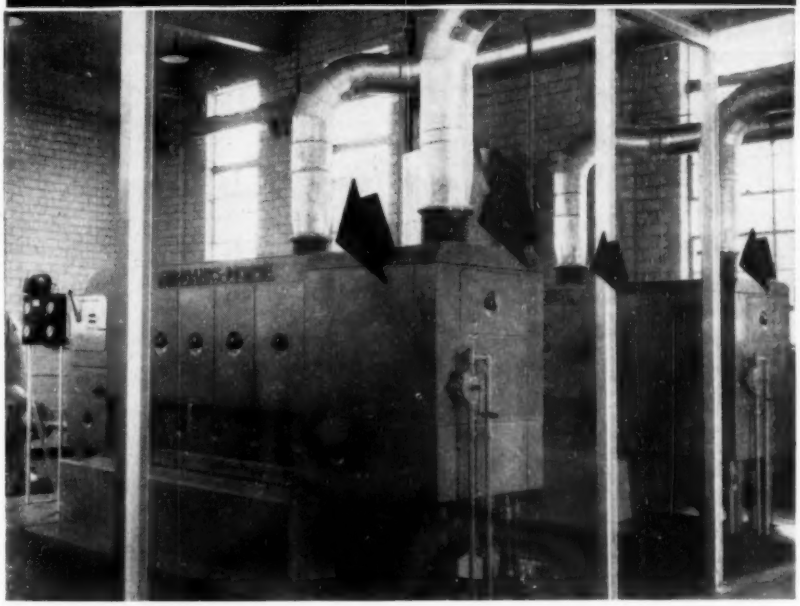
Surface Finishing Process

The story on its new process for controlled surface finishing is made available by American Metaseal Mfg. Corp., 607 65th St., West New York, N. J., in a 4-page bulletin.

Photographs depict how a predetermined finish can be applied to metal parts through use of a special abrasive suspension applied to parts by means of air pressure. Before and after views of various parts are shown and a detailed description of the operation of a new Metablast machine is included. A table of specifications accompanies a list of special features and available accessories for custom-tailored units.

Protect Rigid Piping and Exhaust Manifolds with

CMH Diesel Exhaust Connectors



The CMH Exhaust Connector is a corrugated steel tube designed to dampen exhaust line vibration. By absorbing this ever present motion, the exhaust connector protects and greatly lengthens the service life of rigid exhaust piping and helps prevent fatigue cracking of engine parts. Its protective action prolongs diesel life, reduces maintenance and assures cleaner engine room air.

The CMH Exhaust Connector is low in first cost and easy to install. It can be screwed, welded or flanged into any diesel exhaust line. Sizes range from 1" to 24" I. D. inclusive. For complete information, write for catalog 124.

Flexon identifies CMH products that have served industry for over 50 years.

CMH

CHICAGO METAL HOSE Division

Flexonics Corporation

1363 S. Third Avenue · Maywood, Illinois

Manufacturers of flexible metal hose and conduit, expansion joints, metallic bellows and assemblies of these components.

In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

DIESEL ECONOMY

IS ONE WAY ONLY

IF YOU DON'T PUT ECONOMY "IN", IT WON'T COME "OUT"

Briggs

LONGER DIESEL MILEAGE

Railroads, truckers, marine operators all over the country have used Briggs for years—they have found that wise economy means longer on the job engine performance.

Briggs

LESS DOWN TIME

For stationary diesels, or for that matter wherever diesels may be, clean oil—good, clean, long performing oil —is yours with a longer lasting Briggs.

Briggs

LONGER OIL AND FILTER LIFE

Ask us to send you data sheets covering marine, locomotive, truck, tractor diesels. These cost cutting facts right from the user will indicate the downright economy of using BRIGGS.

THE BRIGGS FILTRATION CO.
River Road, Washington 16, D. C.

Without obligation, send me diesel data sheets from users. I am under no obligation.

NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

news of our industry

5 Alco Diesels to Santa Fe

Five new 6-motor, 1600-hp diesel-electric locomotives built by American Locomotive are now in around-the-clock freight and switching service on the Santa Fe Railway. Weighing approximately 170 tons each, the locomotives are about 56-ft long and have a 42-ft wheel base. They have a maximum speed of 65 mph.

The all-purpose locomotives have been equipped with two extra motors to provide greater pulling power, and are equipped with multiple unit controls so that two or more units may be operated as a single locomotive of greater horsepower. Electrical dynamic braking enables engineers to slow down trains smoothly without use of brakes.

Welding Exposition in May

The American Welding Society announces it will stage its second Welding & Allied Industry Exposition in Buffalo, N. Y., May 5-7. Its national spring technical meeting will be held in the same city, May 4-7.

Every type of welding equipment and most accessories are expected to be on display. Exhibits will include equipment for manufacturing and structural purposes as well as for maintenance needs and considerable emphasis will be placed on welding techniques for the newer metals. Many automatic welding processes will also be featured.

ASME Elects Officers

Lewis S. Sillcox, honorary vice chairman of the board of the New York Air Brake Co., was elected president of the American Society of Mechanical Engineers for 1954. He succeeds Frederick S. Blackall, Jr.

Regional vice presidents elected are Willis F. Thompson, Westcott & Mapes; Professor William G. McLean, Lafayette College; Thompson Chandler, Carbide & Carbon Chemical Corp.; Vernon A. Peterson, Elliott Co.; Professor Clifford H. Shumaker, Southern Methodist University. Directors-at-large are Frank L. Bradley, Forstmann Woolen Co. and Robert B. Lea, Sperry Corp.

RR Dieselizing Near Repletion

Though the domestic railroad dieselization program continues at a high rate, there are indications that the saturation point is approaching, T. F. Perkinson of the General Electric Co. told the recent meeting of the ASME. He said, however, that new designs as well as repetitive models are still issuing from builders' plants.

In presenting a survey of progress in railway mechanical engineering for 1952-53, Mr. Perkinson reported on locomotives of all types, both foreign and domestic, rail cars and trains, passenger and freight cars. "With the domestic railroads' motive-power inventory heavily stocked with diesel-electrics," he said, "U. S. builders are allotting more attention to foreign markets and their requirements for locomotive models peculiarly fitted to work on the generally lighter track structures and smaller gauges found in much of the overseas railway properties."

He indicated that efforts are being made to retain or regain passenger patronage on railroads by addition of new passenger cars, largely conventional in basic design. He pointed to the full-length dome-lounge cars as probably "the most outstanding departure from conventional design." Considerable attention is also being given to the "piggy-back" idea of rail transport of highway freight service, he said. "In some cases", he further stated, "use of roller-bearings on freight equipment is permitting higher-speed operation than was practicable formerly, with resultant improvement in service and a betterment of operating costs."

Device Shows Machine Vibration

Excessive vibration of large engines and other machinery can result in extensive damage. To meet the need of vibration detection, a highly sensitive crystal-type accelerometer has been developed by General Electric Co. The compact device weighs 4 oz and is 1⅞-in high and measures 1-1/16-in in diameter. Its detecting element measures vibration acceleration by gravity.

Output voltage of the detector is

How much of your engine maintenance bill is due to repair of breakdowns that could have been avoided—*if you'd had advance warning?*

At a fraction of that cost, Alnor Exhaust Pyrometers offer you a constant check of engine performance—advance warning of

Cylinder Overload **Preignition**
Scaled Jackets **Clogged Ports**
Detonation **Faulty Injection**

Get the best from your diesel—minimum fuel consumption per horsepower and long service uninterrupted by foreseeable breakdowns. Get constant protection of your engine, cylinder by cylinder, with an Alnor engineered Exhaust Pyrometer System.

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proportionate to the acceleration imparted to the machine on which it is mounted, in a direction perpendicular to the mounting plane. Stud-type mounting transmits the forces directly to an assembly of six barium titanate crystals, said to insure precision and accuracy of the instrument.

Importance of Oil Filtration

To illustrate the necessity of filtration on the tools for producing engines as well as for the engines themselves, U. S. Hoffman Machinery Corp. presents an interesting comparison of operation with and without oil filtration.

When a new grinding department was designed for the precision forging division of the Utica Drop Forge and Tool Corp. at Utica, N. Y., a pilot run was set up before complete facilities could be installed. Two form grinders with insufficient filtering equipment were set up.

The oil used by the two grinders became heavily contaminated after brief use and a sludge load, mostly of metal particles, was deposited on the grinding surface of the wheels, making frequent dressings imperative. Many parts were burned, causing a high percentage of rejects. Oil temperature climbed and created noxious fumes. Largely because of contamination, eight sets of diamonds had to be used on each machine every eight hours for a cost of $496.

After the grinding department was completely equipped, including a functioning filtration system, the problems disappeared. Continuous clear oil was delivered and by keeping grinding wheels free of metallic particles, wheel dressings were reduced 95½ per cent. Cost for diamonds for six machines fell to $62 compared to the previous $496 for two. A larger oil capacity was provided along with absence of friction-creating contaminants, allowing oil temperature to drop to normal and eliminating the noxious fumes. Six thousand gallons of dirty oil which had been accumulated in storage were reclaimed by putting them through the filtration system.

(*Continued on page* 118

Use them Cold

2 Great NEW Strippers for Tough Paint Stripping Jobs

Designed for real tough service, these two NEW Oakite solvent strippers do a wonderful job of removing paint and lacquer that ordinary alkaline strippers won't touch. Used cold, they can't be beat for speedily removing such synthetic finishes as urea-formaldehydes, alkyds, phenolics, urea-melamines as well as lacquers and varnishes.

1 Oakite No. 57 for Brush-on Method

For brush-on stripping of large equipment, Oakite Composition No. 57, used cold, fills the bill. A viscous solvent, it is ideal for removing paint from vertical and inverted surfaces. Its extra viscous consistency enables it to cling to the work. Merely spread with a brush . . . allow to set until the paint bond begins to soften and break. Then a pressure hose rinse finishes the job in short order.

2 Oakite No. 56 for Tank Immersion Method

Used COLD, non-viscous solvent Oakite Composition No. 56 rapidly strips metal parts small enough for complete immersion. It quickly breaks down pigmentation so that the paint dissolves or lifts off in sheets. Light scraping, brushing or a pressure rinse then readily removes all remaining surface traces.

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new products

Camshaft Grinder

The Van Norman Co., Springfield, Mass., announces a new camshaft grinder designated No. 253. It is a heavy machine, and like the rest of the company's line of automotive service equipment, is said to have the weight, speed, and rigidity to do a fast and accurate job.

The new grinder is 52-in between centers and is capable of handling 100-in camshafts by simply reversing the shaft. Maximum diameter is 9 in. There are four workhead speeds: 25, 50, 100, and 200 rpm.

New Molded Oil Seal

Johns-Manville, 22 E. 40 St., New York 16, N. Y., has added the LPD clipper seal, to its line of all molded oil seal. Minimum wear, low frictional heat, and less drag on the shaft are said to result from the lip of the seal contacting the shaft in a thin line around its circumference.

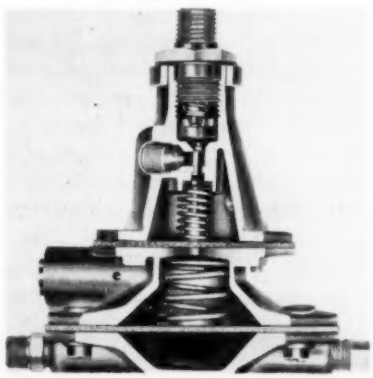
Relationship between lip area and hinge area are also said to remain proportionately the same throughout the range of flange widths and shaft sizes. The hinge controls lip contact and enables the seal to adapt itself to shaft runout and minor shaft eccentricities.

Another feature is the composition heel which will conform of bearing cavity to close tolerances to irregularities to make machining unnecessary. Because of this heel, replacement of seal can be made without damage to seal or cavity.

Tank Drain for Air Brakes

Redesigned pressure seals for long life have been incorporated in an improved tank drain for air brakes and compressed air tanks made by Wilkerson Corp., 3469 S. Platte R. Dr., Englewood, Col. The improved Model 1022 is said to completely eliminate manual draining of air brake systems by blasting off water, oil, and sludge accumulated in the bottom of the receiving tank before contaminants reach vital parts. The unit is designed to operate even at sub-zero temperatures.

A larger version of the same drain, Model 1041, is for railroad locomotive applications. In both units, an accessory governor actuates the drain diaphragm once in each compressor cycle. An adjustable bleeder can be set for a discharge of any duration, during which moisture and sludge accumulations blast from the system under full tank pressure. A double valve leads into the pressure tank so that if drain is accidentally sheared off the vehicle, braking is not affected.



Small-Parts Storage Cabinets

Production of a complete line of drawer cabinets for small-parts filing and storage has been announced by General Industrial Co., 5738 Elston Ave., Chicago 30, Ill. Models range from 8 to 128 drawers.

The popular Model J-20 consists of 20 crystal-clear guaranteed plastic drawers, 5 7/7-in long by 2¾-in wide by 1 7/16-in high in an all-steel cabinet equipped with rubber feet. Adjustable drawer dividers and identification labels are included.

Pocket-Size Calculator

Goodmark, Inc., 21 E. 2nd St., Dayton 1, Ohio, is distributing a pocket-size calculator called Derck's gauge dial. The device has 13 tables giving the sizes of lettered drills in decimals and division of circles, giving chords and including angles of division. Included are distances across flats and corners of squares and hexagons, taper-pins and reamer sizes, machine screw tables, thread tables, pipe tap sizes, tapers and angles, and Woodruff Key sizes. All of the tables are on one dial, on two sides, arranged to be easily understood without chance of error.

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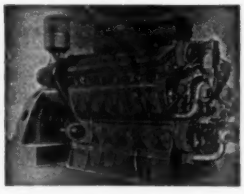

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news of our industry

Full-Flow Filtration

Severe service, which is normal operation for most diesel locomotives, has indicated the need for a maximum degree of lube oil filtration. Cleaning all the oil on each pass through the engine, full-flow filtration, offers the best chance. A major difficulty has been lack of space for the size of installation required with conventional filter elements so as to combine fine micronic filtration with adequate service life at acceptable pressure drops.

Wm. W. Nugent & Co., in announcing some details of tests conducted with one of the major railroads, states that with their new cartridge this can be done in the same space currently allocated for filtration equipment. In fact, on the Alco 12- and 16-cyl vee-type engines, the same filter shells can be used with some piping changes.

The new filter elements are of the cellulose stack-disc type, providing 3100 sq in of surface in comparison to the 560-sq in surface of the cotton waste type cartridge. The discs, impregnated with a resin binder to prove relatively impervious to moisture and temperature effects, filter particles down to 2-micron size.

In a test, in which a 2250-hp vee-type engine provided locomotive power for about 35,000 miles, the eight cartridges collected 167 lb of dirt, indicating their capacity. Starting with a new heavy-duty oil and clean cartridges, the pressure drop was 4 psi. At the mileage mentioned, the differential pressure had risen to 25 psi and the cartridges removed. Oil analysis revealed total impurities amounting to 0.17 per cent.

RR Papers Set for AIEE Meet

The American Institute of Electrical Engineers will have nine papers on the electrical engineering aspects of railroading presented during two sessions on land transportation at its winter general meeting in New York City, Jan. 18-22.

Scheduled for the afternoon of Jan. 20 are the following papers: "Fundamentals of Flashing of Diesel-Electric Motors and Generators" by C. A. Atwell, Westinghouse Electric Corp.; "Flashover of Diesel Traction Motors and Main Generators" by J. R. Schoonover, Lehigh Valley Railroad; "Summary of Report on Diesel-Locomotive Flashover" by W. B. Miller, Chicago & North Western Railroad; and "Static Excitation Control for Diesel-Electric Locomotives" by S. W. McElhenny and R. M. Smith, General Electric Co.

ASTM Widens Corrosion-Testing

The American Society for Testing Materials, advisory committee on corrosion, recently took action to expand its test site facilities. This was in recognition of a billion dollar annual loss (conservative estimate) due to corrosion of metals. Authoritative and impartial atmospheric and other exposure tests have been providing engineers with reliable data for design and operation of structures and equipment.

Projected programs of the society as well as outside interests for the use of test site space has necessitated additional facilities. It was agreed that 110 additional racks be fabricated, 60 of monel (for marine exposure) and 50 of Type 302 stainless steel. These 110 racks will provide space for 7700 additional 4-in by 6-in specimens.

Machinery Production Report

The United States produces more machinery than all the rest of the world together and is the leading producer of almost every kind, according to a new report, "World Population and Production", recently issued by the Twentieth Century Fund. Machine tool output soared during World War II when industry produced in four years, tools equivalent to more than 20 year's production at prewar rate.

The full report, written by W. S. and E. S. Woytinsky, runs 1268 pages and includes data on the earth's production in agriculture, energy and mining, and in manufacturing. Production is said to be greater in the United States partly because more electric power is available.

In agricultural machinery, particularly in tractors, world production has taken tremendous strides. Tractor production more than doubled compared with 1937, and in 1951 output approached one million units. The United States ranks first in this, followed by the United Kingdom, the USSR and Western Germany. In production of railway equipment, the United States stands as the largest producer of locomotives and freight cars, and the United Kingdom is first in passenger car output.

The authors predict that increasing development of machinery and transportation equipment industries will be advantageous "because of the demand abroad for machinery and transportation equipment of more exacting types".

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What Do You Know!

(*Answers to questions on page* 90)

1. Results of a survey conducted to forecast 1954 production and revise 1953 estimates as reported on Page 38, pegs 1953 production of diesel engines at about 125,000 units.

2. Correct answer is "a." An important function of supercharging is to blow out residual combustion gases remaining in the cylinder after the exhaust stroke. By replacing the hot gases with fresh air, more oxygen is available for the combustion of more fuel. For a discussion, see article on Page 30.

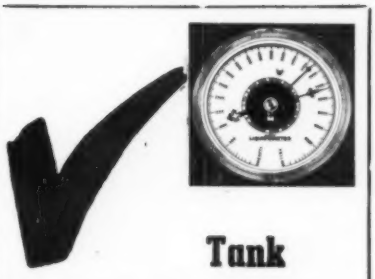
3. "a" and "d" are correct. Burning more fuel produces higher temperatures and pressures. Engine materials will only stand so much heat and still give long life. Also, in a given design there is a limit to the stresses that can be safely imposed. See the article above.

4. Correct answer is "b." Recent developments in turbocharger design and general technological developments have produced turbocharged 2-cycle engines both here and abroad. For a discussion of one such engine, see the article on Page 46.

5. "d" is correct. Current modernization facilities give indication of not only extending useful life indefinitely, but will update older units to current new-unit performance standards. A discussion of one such program appears on Page 43.

6. Correct answer is "d" although, of course, circumstances would alter cases. In general, there would not be commercial facilities available in the remote logging areas. Return of "down" equipment to a centralized shop is not practical. See Page 44 for such an operation.

7. "b" is correct. "a," of course, must be set correctly to time the pump to the engine. "c" is for balancing fuel among the cylinders. See the article on Page 38.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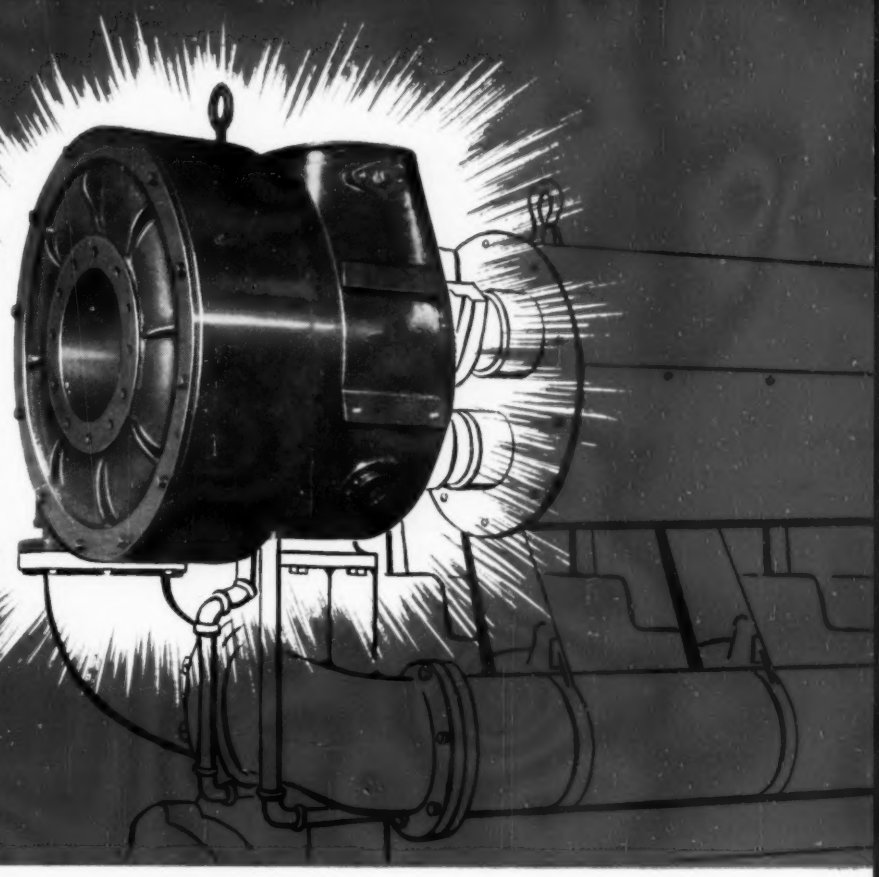

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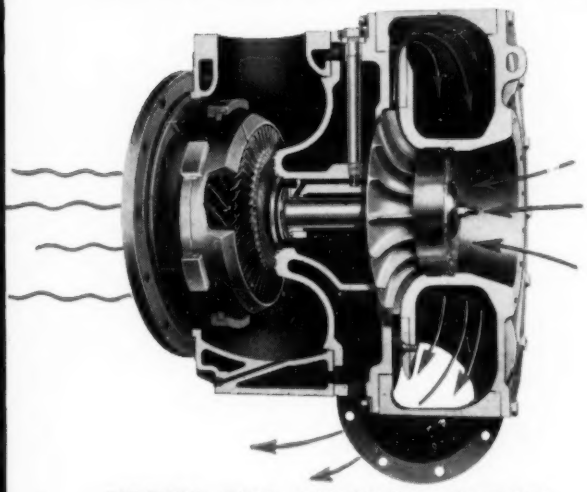

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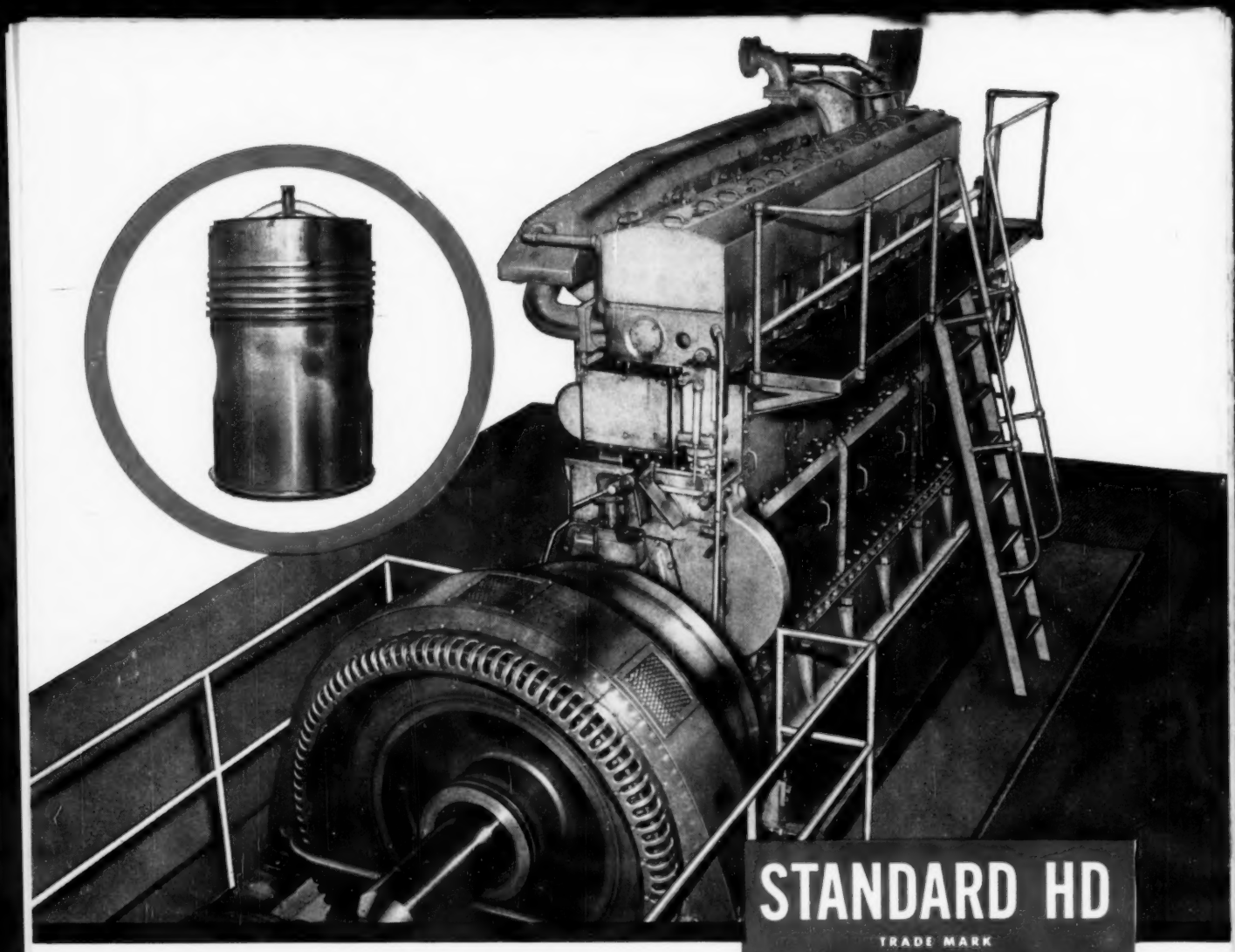

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21,000 hours young!

● This 1320-hp diesel engine has provided many hours of economical service for the City of Benson, Minnesota, Water and Light Department since it was installed in October, 1948. It has been operated on an average of 20 hours each day and has generated over 13 million KW at an average load factor of 75%.

In this hard-working diesel, the lubricating performance of STANDARD HD Oil has been outstanding, particularly in view of the fact that crude oil has been used as fuel. Visual evidence of the clean, protective lubrication proyided by STANDARD HD is presented in the above unretouched photograph of a piston removed from the diesel after 21,000 hours' operation. Deposits are at a minimum; rings are free. The original fill of STANDARD HD has not been changed, yet a recent examination and analysis of the oil showed it to be in excellent condition.

Diesel operators throughout the Midwest are receiving service like this from STANDARD HD Oil. The Standard Oil lubrication specialist serving in your section of the Midwest will be glad to give you information about the use of STANDARD HD in plants near your own. Just phone your local Standard Oil office. Or, write: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

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